THE GAS JOURNAL

OCTOBER 12, 1932

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A Glance at the Contents—

Carbonizing Plant at Beauvais.

An illustrated description of the gas manufacturing plant at the Beauvais Gas-Works appears on p. 147.

Centenary of Gas at Dumbarton.

It was a happy idea on the part of the B.C.G.A. to arrange for a Scottish District Conference in Dumbarton during the celebrations of the centenary of the Gas Undertaking. [p. 143.]

Assistant Manager Required.

The Merthyr Tydfil Gas Company are advertising for an Assistant Manager with a good practical knowledge of modern methods—stoking machinery, C.W.G. plant, &c. [p. 168.]

An Historical Essay.

The Presidential Address of Mr. A. C. Hovey before the North of England Gas Managers' Association is a survey of the Industry's progress in the present century. [p. 157.]

Rental Superintendent Required.

The South Metropolitan Gas Company are making application for a rental superintendent to control the work of a department dealing with over 400,000 accounts monthly. The salary will be not less than £1000 per annum. [p. 167.]

Gas-Works Manager Required.

A Gas Department in Cheshire is inviting applications for the post of Manager. [p. 167.]

Works Superintendent Required.

Applications are invited by the South Metropolitan Gas Company for the position of Works Superintendent at their East Greenwich Works. Candidates should be between the ages of 30 and 35 years, and salary will be commensurate with qualifications and experience. [p. 167.]

The New Patent Act.

Business men and manufacturers whose work brings them into contact with novel developments will be interested in an account of the changes in the law relating to inventors and industrial designers which will be effected when the Patents and Designs Act, 1932, comes into force on Nov. 1. [p. 148.]

" Business Men First."

" We must realize that a gas manager in the year 1932, and in the years to come, must be first and foremost and very effectively *a business man*, devoted to the commercial conduct of a competitive business; and that all the technology, all the chemical science, all the gas engineering in the world will avail us nothing unless we can sell, in increasing measure, the product of our technical and chemical skill." —Sir Francis Goodenough, C.B.E. [p. 143.]

Forthcoming Engagements

Oct. 13.—INSTITUTION OF GAS ENGINEERS.—Meetings of Joint Lighting Committee, 11 a.m.; Gas Appliances Sub-Committee, 2.30 p.m., 28, Grosvenor Gardens, S.W. 1.

Oct. 14.—SOCIETY OF CHEMICAL INDUSTRY.—Meeting of the CHEMICAL ENGINEERING GROUP, Burlington House, Piccadilly, 8 p.m. Paper by Prof. J. S. S. Brame on " Colloidal or Coal-Oil Fuel."

Oct. 14.—MANCHESTER DISTRICT ASSOCIATION OF GAS ENGINEERS.—Visit to works of Messrs. Clayton, Son, & Co., Ltd., Hunslet, Leeds.

Oct. 15.—MANCHESTER AND DISTRICT JUNIOR GAS ASSOCIATION.—Meeting in Liverpool.

Oct. 18.—ILLUMINATING ENGINEERING SOCIETY.—Visit to the Shakespeare Memorial Theatre, Stratford-on-Avon.

Oct. 19.—B.C.G.A.—Meeting of the Executive Committee, 28, Grosvenor Gardens, S.W. 1, 2.30 p.m.

Oct. 20.—SOCIETY OF BRITISH GAS INDUSTRIES.—Meeting of Council at 56, Victoria Street. S.W. 1, in the afternoon.

Oct. 20.—INSTITUTION OF GAS ENGINEERS.—Meetings of Refractory Materials Joint Sub-Committee, 11 a.m.; Pipes Sub-Committee, 2.30 p.m., 28, Grosvenor Gardens, S.W. 1.

Oct. 22.—MIDLAND JUNIOR GAS ASSOCIATION.—Visit to Messrs. Geo. Wilson Gas Meters, Ltd., Coventry.

Oct. 22.—SCOTTISH JUNIOR GAS ASSOCIATION (WESTERN DISTRICT).—Visit to Meter Works of Messrs. W. & B. Cowan, Glasgow.

Oct. 27.—SOUTHERN ASSOCIATION OF GAS ENGINEERS AND MANAGERS (EASTERN DISTRICT).—Meeting at 28, Grosvenor Gardens, London, S.W. 1, 2.30 p.m.

Oct. 27.—MIDLAND ASSOCIATION.—Meeting at Imperial Hotel, Birmingham. Paper by Mr. Arthur Roberts.

Oct. 27.—EASTERN COUNTIES GAS MANAGERS' ASSOCIATION.—Meeting at 28, Grosvenor Gardens, S.W. 1, 2.15 p.m. Paper by Mr. C. B. Donkin.

Oct. 31.—LONDON AND COUNTIES COKE ASSOCIATION.—Meetings of Executive Committee, 11 a.m.; Central Committee, 12 noon; Luncheon, 1 p.m.; Annual General Meeting, 2.30 p.m.; Hotel Metropole, Whitehall Rooms, S.W. 1.

Nov. 1-2.—INSTITUTION OF GAS ENGINEERS.—Autumn research meeting.

Nov. 3.—SOCIETY OF BRITISH GAS INDUSTRIES.—Autumn General Meeting, Hotel Metropole, London.

Nov. 16.—SOUTHERN ASSOCIATION.—General Meeting, Hotel Metropole, London, W.C., at 2.15.

EDITORIAL NOTES

Our Two-Hundredth Volume

WE may be pardoned, perhaps, for drawing attention to a coincidence in connection with the last issue of the "JOURNAL"—namely, that besides containing the report of the "coming-of-age" conference of the British Commercial Gas Association, it was the first number of our 200th volume. Consequent upon the fact that, at different times of its long life, the "JOURNAL" has been divided into two-yearly, yearly, half-yearly, and quarterly volumes, the 200th volume has been reached in the 84th year of publication. The new volume opens with an issue devoted mainly to the industrial load, and showing clearly the vast and brilliant prospects that lie ahead of the Gas Industry. The number of pages embraced in the issue is 128. The first volume (in 1849) began with a number consisting of 20 pages, and the opening lines were in striking contrast to the confidence of the present day. These words were printed on the very first page: "The shareholders in Metropolitan Gas Companies seem quite panicstruck, if we are to judge from the continued fall in the value of their shares at the Stock Exchange." The prices quoted showed a fall between January, 1848, and January, 1849, in the shares of nine Metropolitan Companies amounting to nearly 20 per cent. "How much of this is due to the mania for cheap gas," the writer went on to say, "or how much to the dread of the electric light, it is scarcely worth while inquiring; but the great fact is before us, that a depreciation to the extent of upwards of half-a-million of money has taken place in the market value of this property, and it seems to be daily augmenting."

Those were times when gas affairs created a considerable amount of public excitement, and another of the comments in the first issue of the "JOURNAL" was: "The cry for 'cheap gas' in the Metropolis is not so easily disposed of; and our position as independent observers of the temper and spirit of the times gives us greater opportunities for judging of the gravity of the question than those engaged either in raising the storm or attempting to resist its violence. We are not, therefore, without some fears that, unless the movement be checked by prudent and comprehensive measures, the result may be a serious permanent injury to the public, as well as to the owners of Metropolitan gas property. The useless expenditure of capital in new competing works, destined at no remote period to be united in friendly alliance of interest with those establishments they were intended to destroy, has, in our opinion, inflicted a far more serious injury on the public at large than is compensated by the benefit they have derived from the anticipation, by a few years, of reductions in the price of gas, which most of the old companies were disposed to make as their means allowed. We believe that, during the last twenty years, more than a million has been squandered in this manner, on which the consumer must now pay interest in one shape or the other." Compare that state of affairs with now, when the future of the Industry is admittedly largely bound up with a cheapening of the cost of gas to make it more extensively available for the purposes of industry.

The 100th volume began with a number consisting of 64 pages, and was published in the autumn of 1907. One of the features was a description of novelties for the heating and lighting season. Electricity had been long with us then, but nothing was said in that number of the "JOURNAL" as to "panicky" gas stocks—and, indeed, the "Stock and Share List," which was then as now a valued page, revealed round about that time steadiness with an upward tendency. Prices were at figures many of which showed a yield upon investment of less—some of them much less—than 5 per cent., which is evidence of the esteem in which gas stocks were held. There was in that number of the "JOURNAL" a preliminary list of firms taking part in the Manchester Gas Exhibition, which to some of us does not seem to have been held so long ago as 25 years. The 300th volume has yet to be written, but of it this much with confidence may be said—that it will represent on the part of the Industry continued endeavour and successful achievement; and that the prospects it will portray will be no less bright than those which confront us to-day.

The Position To-Day

"THERE is ample proof that the Gas Industry is well organized and equipped, that there is co-ordination and co-operation among its specialized sections and ranks, all of which constitute a firmly secured and progressive business in which there is diligent endeavour to increase its efficiency and extend its usefulness." This quotation is from the Presidential Address of Mr. A. C. Hovey to the North of England Gas Managers' Association—an Association of which the President has been a member for thirty-five years. The Address is a dispassionate and accurate survey of the progress of a great Industry during the present century, and discloses a wide and intimate knowledge of the work and influences, both within and without the Gas Industry, which have led to the present flourishing and progressive condition. We feel sure that Mr. Hovey's carefully planned and comprehensive essay will lend added conviction to its readers of the strength of our Industry, and will encourage greater individual and co-operative effort towards advancement.

The whole position of the Gas Industry to-day bears no relationship to the state of affairs at the beginning of the century. Its power of serving the community is infinitely greater; efficiencies of manufacture, distribution, and utilization are higher; sales organization is far more effective. The spur of competition has transformed the attitude of gas undertakers, has brought about a realization that modern business methods, modern salesmanship, are essential to the life of an Industry which has emerged from its monopolistic days. The future will not be easy; but we believe that our Industry is prepared not merely to hold its own as a purveyor of an economical form of energy which fulfils all the demands of hygiene, but to exploit successfully new and vast fields in industry and the home.

Mr. Hovey's Address should engender faith in the Gas Industry; and faith is the mainspring of progress. It is easy to say that the development of the Industry since 1900 is not what it might have been. It is a fact, for example, that the gas used per consumer is less in 1931 than in 1900. A remedy for this lies in new methods

of charge such as were discussed at the B.C.G.A. conference a few weeks ago, and in keener salesmanship. In the early part of this century we lost ground on this all-important matter of "sales per consumer," and by 1913 the figure of 36,740 c.ft. had fallen to 29,068 c.ft. The rot has been stopped, however, and growth is being registered. Statistics are, of course, exceedingly difficult to handle. In regard to the foregoing figures, for instance, the spending power of the people, the country's economic and industrial condition, and competition are influences which have a direct bearing on any conclusion. The point we should bear in mind is that the load curves of the Gas Industry are on the up-grade, and that efficient sales machinery exists to be put into effective use.

During this century the amount of gas sold has doubled; the capital invested has doubled; the number of consumers has more than doubled, and now stands at 10,000,000. And we are on the threshold of development, for we are better equipped technically and commercially than ever before, and we have, generally speaking, the right commercial attitude towards our business. We are definitely not 100 per cent. efficient; but we are more youthful than ever, and in some respects in advance of the times. The public are beginning to appreciate the possibilities of gas service, and will believe in it more as our own belief becomes more sincere and more expressive. This belief will not be lessened by studying Mr. Hovey's Address.

Competition

As far as engineering and technical progress is concerned, the Gas Industry has put its house in order to meet competition. Mr. Hovey's outline of the means by which the efficiency of gas manufacture has been raised since the beginning of the century makes good reading, and we are glad to note his advocacy of benzole recovery and of gas drying, and are interested in his reference to the possibility of new steels proving suitable for retorts.

Of particular importance are his observations on the competition from electricity and oil—our two most formidable rivals. The average thermal efficiency of electricity generation is to-day 15 p.ct., and on an average 13 heat units in the form of electricity are delivered to the consumer from every 100 heat units in the coal burned. This, compared with the efficiency of gas production and distribution, is nothing to boast about. The consumer may not be greatly concerned with this, but he is certainly concerned about his bills for electricity, and it is a fact that if the thermal efficiency of electricity generation were further considerably improved, the average charge per unit to the consumer could not be much reduced, for the average cost of generation is now only 0·26d. per unit. Mr. Hovey quotes the Chairman of the largest electricity supply company in the country, who explained a few months ago that the main saving of the national electricity scheme would be confined to the reduction of generating costs, but that these costs represented only a small part of the total costs of supply. Further, that in any district where to-day generation is reasonably efficient the improvement produced by the scheme would have no effect in reducing the price of domestic supplies. We are thus brought to the conclusion that the future of gas *versus* electricity will be one of salesmanship *versus* salesmanship, commercial ability *versus* commercial ability.

Imported oil is free from restrictions which hamper the Gas Industry. Its purveyors, as Mr. Hovey points out, can choose their customers as may be most convenient and profitable. The country is paying £40,000,000 per annum for imported oil, the work of much of which could equally well be done by gas, to the benefit of the nation. An increased demand for gas would result in a lower price, and would increase employment in the mines. As it is, 70,000-80,000 miners are needed to produce coal to meet the Gas Industry's requirements; and every additional 200 tons of coal carbonized gives employment to one miner. Every effort made to support the Industry is sound nationally. Also, there is good reason why the coal industry should regard gas as an ally. Instead, however, it remains content to play into the hands of the oil interests by increasing the prices of coal to the Gas Industry.

Returning Confidence and the Investor

We were intrigued a few days ago on glancing through a British United Press telegram from Paris which set out to explain "why a Canadian manufacturer was impressed." It was by London that this manufacturer had been impressed, for after visiting other places the conviction had been borne in upon him that "London is the only city in the world that is doing real business to-day." This opinion must, of course, have had reference to financial business and regarded in that light it gives real cause for satisfaction—as there is, again, in his contention that "London is also 'the' city of the world to-day." He has found the people cheerful, which furnishes further reason for congratulation, though in this part of the message we are in some little doubt as to which is the horse and which is the cart. What the manufacturer says is: "The people are cheerful because they know they are pulling through, and it is because of this cheerfulness that they are pulling through." This rather reminds one of the time-honoured conundrum: "Which came first, the chicken or the egg?"

But, seriously, we do believe that a return of confidence must be the first stage in any real recovery, and that there is evidence of growing confidence to-day which would have been sought in vain a very short time ago. Referring still to the financial world, it has been possible during the past week, consequent upon the partial lift of the ban on capital issues, to test this increase in confidence. Several appeals for capital were made, and in each case the results afforded overwhelming proofs of the readiness of investors to subscribe to sound new issues. A great deal of capital must be needed to place industry in a position to take full advantage of the opportunities that are approaching, and it is most gratifying to know that investors are willing to provide it. So we are getting on—first, there have been these signs of returning confidence, and now, as a result of this returning confidence, we see a freer flow of capital.

Correspondents Overseas

It is always a pleasure to hear from correspondents in the Dominions overseas—those who are so far from us, and yet so near to us—as well as from readers in other countries; for it is, alas! upon correspondents that most of us have to rely for knowledge of affairs in distant parts of the world. The Gas Industry, we know, pursues its useful functions everywhere, and in all situations the fundamentals, no doubt, are much the same. But varying conditions must necessitate differences in practice, and so it is of interest to learn "what the other fellow is doing." Will readers overseas kindly regard this as an invitation to favour the "Journal" more frequently with their views and experiences?

This note is prompted by the fact that the latest mail from New Zealand has brought us more than one communication pointing to the "live" nature of the Gas Industry in the Dominion. It is especially pleasing to learn from Mr. James Kennedy, the Engineer and Manager of the Greymouth Corporation Gas Undertaking, New Zealand, of his conviction that "advertising pays" with his undertaking, just as is the case in this country. He forwards specimens of excellent publicity, which furnish evidence of that enterprising spirit which we like to see. This publicity is regular, thus ensuring the utmost benefit from the appeal. Mr. Kennedy is to be congratulated also upon the facts that his works have nearly reached their diamond jubilee of sixty years in operation, and that he has been Manager of them for approaching 45 years. The works were purchased 30 years ago by the Borough Council from the Gas Company, and both the Company and the town have been fortunate in their ownership. This is the sort of record to which it is a gratification to be able to call attention.

CORRESPONDENCE

Wind Pressure on Gasholders

SIR,—The article entitled "Wind Pressure on Spiral Gasholders," the first part of which appears in this week's issue of the "JOURNAL," has been prompted by the letter of Mr. J. Richard Dorsey, Assoc.M.Am.Soc.C.E., in the "JOURNAL" of July 27 last, in which he asks for further information with regard to experimental observation of the action of wind on gasholders. Although the subject-matter deals principally with the problem so far as it relates to spiral gasholders, it is hoped that the article will be of use when considering the action of wind on waterless holders.

In the case of waterless gasholders, the ratio of height to diameter is usually much greater than in water-sealed holders, and this feature will tend to result in a wind distribution more in conformity with that obtained for long cylinders. This is graphically illustrated in recent experiments carried out on a model waterless holder, the results of which are published in the Göttingen Report, Part 3, No. 18, p. 144, entitled "Winddruckmessungen an einem gasbehalter."

This report concerns the testing of a model waterless holder 300 mm. diameter and 630 mm. high in an air tunnel with a wind speed of 30 metres/sec. The results obtained generally confirm Dryden and Hill's experiments on cylinders 12·5 in. and 8·5 in. diameter by 5 ft. high for wind speeds above the critical value of the Reynold's number. So far as the centre of pressure on the cylindrical surface is concerned, this appears to be situated at half the height of the model. It is also interesting to observe that a suction amounting to 0·485 p (p = normal wind pressure) was found to operate at the centre of the roof.

The model of the holder in this instance consisted of a smooth cylindrical metal casing, and in this respect differed from the actual structure, which is polygonal in shape. Another type of waterless holder on the market is circular, but both forms have numerous projections on the surface. As the lamina flow of the wind is disturbed by these projections, it is possible that the distribution of the wind and the resulting drag may differ from that obtained by experiment on a plain cylinder. At this stage of progress, however, both in the case of waterless and water-sealed holders, assumptions with regard to wind pressure must be based upon the general results of past experience and such information as is available from experiments on models in wind tunnels.

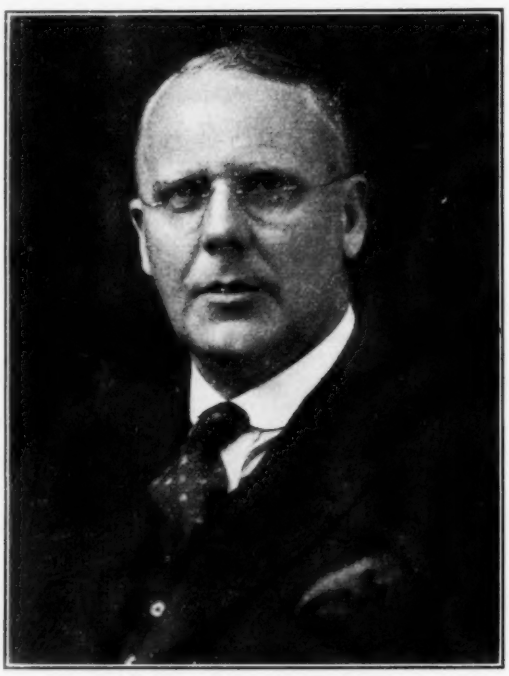
Yours, &c.,
S. M. MILBOURNE.

31, *Warren Road,*
Cricklewood,
London, N.W. 2,
Oct. 3, 1932.

PERSONAL

MR. G. P. MITCHELL'S NEW APPOINTMENT.

Staff, town councillors, and general public alike at Blackburn will regret the impending departure of Mr. G. P. Mitchell, the Corporation Gas Manager and Engineer, who has been appointed to the position of General Manager and Engineer to the Worcester New Gas Light Company, out of 150 applicants. He starts his new duties at the end of the year.



MR. G. P. MITCHELL.

Mr. Mitchell, whose connection with municipal enterprise extends over 23 years, went to Blackburn in 1919, and has completely re-organized the Corporation Undertaking in the manufacture, distribution, and sale of gas. The town and consumers alike have benefited in many ways by his progressive policy. Responsible for the administrative and commercial side of the undertaking, Mr. Mitchell has, despite heavy capital expenditure, reduced the capital debt per million c.ft. of gas from £743 to £448. The price of gas nas been reduced from 4s. 10d. per 1000 c.ft. to 3s. 6d., and no alterations in prices were made during the disastrous coal disputes of 1922 and 1926.

Central showrooms have been opened and the old Addison Street Works have been closed except as a distributing centre. New mains and services have been laid throughout the town to give a more efficient supply. In 1927 a new carburetted water gas plant and a 2-million spiral-guided holder were opened, and at the official ceremony high tributes were paid to Mr. Mitchell's ability. Mr. Mitchell, who is still young, has been Chief Assistant to the Engineer and Manager of the Gas and Electricity Department at Alloa, Chief Assistant to the Gas Engineer and Manager at Dundee, and Gas Engineer and Manager at Port Glasgow.

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After spending 30 years in the service of the Eastbourne Gas Company, Mr. JOHN ROBERTS, the Chief Clerk at the works, has retired.

The event was made the occasion of a pleasant little ceremony, when a farewell presentation in the form of a portable typewriter, with an appropriate inscription, was made to Mr. Roberts by the Works Manager, Mr. Stanley W. Hammond, on behalf of the staff, employees, and pensioners at the gas-works. In making the presentation, Mr. Hammond conveyed the general regret at Mr. Roberts's departure from the works, and made appreciative allusion to his many years of loyal service to the Company and to the personal qualities which had earned him the esteem and regard of all those associated with him at the works. Mr. E. A. Smith, Works Superintendent, and Mr. E. J. Morris, on behalf of the yard staff, added further testimony to the position Mr. Roberts had won in the regard of his fellow workers.

Returning thanks, Mr. Roberts spoke of the many happy years he had spent at the works and the friendliness and consideration extended to him by everyone.

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Mr. JAMES OLIVER SCOTT, Sales Manager, of Messrs. Alder & Mackay, Ltd., Gas Meter Manufacturers, New Grange Works, Edinburgh, has been appointed to a seat on the Board of Directors of the Company. Mr. Scott, who prior to 1914 was the Company's Representative in Scotland and Ireland, has completed some thirty-eight years' service.

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Mr. JOHN RAMAGE, B.Sc., has been appointed Secretary to the Industrial Co-Partnership Association.

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Mr. F. L. BAKER, Outdoor Superintendent to the Chelmsford Gas Department, has been appointed to a similar position under the Tendring Hundred Gas and Water Company. Mr. Baker went to Chelmsford in 1912, from the Shanklin Gas Company, as Showroom Manager. After

serving in the R.G.A. during the war, he was appointed to the position which he is now relinquishing.

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Mr. JOHN GOULD DREW, of Starcross, Devon, for many years a partner of Messrs. J. & H. Drew, surveyors and land agents, of Exeter, and a Director of Exeter Gas Company, left £9315 (net £8702).

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The Grand Council of the Federation of British Industries have unanimously appointed Mr. GUY LOCOCK, C.M.G., Director of the F.B.I.

OBITUARY

The death has occurred at Tynemouth of Mr. THOMAS YOUNG, J.P., aged 78, who had been a Director of Tynemouth Gas Company for 32 years and was Chairman in 1921.

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The death recently occurred, as the result of a motor accident, of Dr.-Ing. OTTO MEYER, General Manager of the Dortmund Gas Lighting Company, and a former President of the German Association of Gas and Water Engineers.

THE NEWS OF THE WEEK

"**Town Gas in Industry**" was the subject of an address given recently by Mr. A. E. Ruffhead, the Darlington Corporation Gas Engineer, to the members of the Darlington Engineering Society.

A Change from Electricity to Gas.—The Lymington Town Council have decided to use gas for public lighting at the end of the electric contract in March next. Electricity has been used for 32 years, and the Lymington Gas Company have now obtained the contract.

The Bristol Gas Company have started a series of lectures and practical cookery demonstrations which are being given in the Little Theatre, Colston Hall, Bristol, daily until Dec. 20. Miss A. A. Andrew, Cordon Bleu N.T.S.C., will be the lecturess. Another series of lectures has been arranged from Jan. 10 to March 28, 1933.

The Women's Institutes have made their way closely into the hearts of the public all over the country, and their sessions are always really worth while. At the Women's Institute, Hillingdon, Uxbridge, recently, Miss Jaques, of Radiation Ltd., gave a very successful cookery demonstration, using a "New World" cooker. About sixty people were present, and they expressed themselves as very pleased with the enjoyable nature of the session.

Two Divers are Engaged in getting rid of mud which prevents one of the gasholders at the Windsor Street Gas-Works, Birmingham, from properly resting on its stone bed, some 50 ft. below the ground level. By means of hydraulic pressure the divers are breaking up the obstruction, which is then cleared away by powerful suction pumps. The tank, at the bottom of which the divers work alternately for two hours at a time, is 50 ft. in depth and holds more than 11 million gallons of water.

Long Service Certificates at Leamington.—Certificates were presented by the Chairman of the Leamington Priors Gas Company (Dr. Harold Mason) last week to Mr. William White, senr., of 115, Shrubland Street, who retired on Dec. 31, 1931, after 60 years' continuous service at the Gas-Works, and also to five other pensioners—W. Boucher (49 years' service), T. A. Cooke (49 years'), H. Mountford (49 years'), J. Rose (42 years'), and D. Tarver (43 years'). The certificates were tastefully executed in gold and colour, and recorded the appreciation of the Board of Directors for loyal service in the employment of the Company.

A Plea for the Application of Surplus Profits of the Gas Undertaking to permit a reduction of the price of gas to small as well as to large consumers was suggested at the October meeting of the St. Helens Town Council. In the minutes of the Gas Committee appeared a resolution that the question of the reduction of the price to large consumers be referred to a sub-committee with power to act. The wisdom of this course was questioned on the ground that to make the reduction to one section of consumers only was unfair. It was considered that the reduction should be made *pro rata* to all consumers. The Vice-Chairman of the Gas Committee said they were up against great competition from oil, and if they did not reduce the price of gas to the large consumers, there was a possibility that they would lose those customers. "If we do that," he said, "we might be placed in the position of having to increase the price all round." It was agreed to delete the words, "with power to act."

Dr. H. T. Angus, Chief Chemist of the Parkinson Stove Company, Ltd., Birmingham, delivered an interesting Lecture, entitled "Combustion—with special reference to Burner and Appliance Design," at a meeting of the Scottish Gas Salesmen's Circle, held at the Chamber of Commerce, Edinburgh, on Oct. 5. Mr. A. Munro presided over a good attendance. That the lecture was much appreciated was shown by the number of questions put to Dr. Angus who was cordially thanked for his helpful remarks.

Serious Complaint has been made to the Haworth Urban District Council of breakages of glass and mantles in gas street lamps. It was stated to be impossible to keep certain districts properly lighted and there had been repeated complaint from the public. The cost in repairs latterly, it was estimated, amounted to a penny rate and was due solely to wilful damage by irresponsible people. The Surveyor spoke of one particular lamp which had cost £7 in repairs and they had had to cease lighting it as they could not keep pace with the damage. It was resolved to issue a public warning that offenders caught would be taken to Keighley for prosecution, and the Council would press for the maximum penalties.

Trevithick Centenary.—We learn on good authority that a movement is on foot among the engineering profession to mark in an appropriate manner the Centenary, in April next year, of the death of Richard Trevithick, one of the greatest of our engineers. A meeting of representatives of Engineering Institutions has been called for Thursday, Oct. 20, at 5.30 p.m., at the Institution of Civil Engineers, Great George Street, Westminster, S.W. 1, the Council of which has generously placed accommodation at disposal for the purpose. Engineers generallv. interested in the proposal, are invited to attend. The movement was started by the Newcomen Society for the Study of the History of Engineering and Technology, the Hon. Secretary of which is Mr. H. W. Dickinson, Barn Field, Riddlesdown Road, Purley, who will be pleased to answer inquiries.

Watford and St. Albans Co-Partnership and Pension Funds.—The Committee of the Watford and St. Albans Gas Company Co-Partnership and Pension Funds, in presenting the twenty-third annual statement of accounts and balance-sheet of the co-partnership fund, together with the statement of accounts of the pension fund for the year, state that the membership of the co-partnership fund now totals 405, and the bonus and interest paid by the Company for the year amounts to the substantial sum of £2464. The pension fund has now a membership of 360, and the balance to the credit of the fund totals £18,520. Nearly £13,000 has been invested in 5 per cent. War Loan Stock, but in common with many other pension funds this was converted into a similar amount of 3½ per cent. War Loan Stock in July last. The Committee wish to congratulate the employees on the splendid collections made by them during the year for the local Hospitals. The amounts are as follows: For Watford Peace Memorial Hospital, £42 19s.; St. Albans and Mid Herts Hospital, £65 3s. 7d.; West Herts Hospital, £10 7s. 9d.; Dr. Barnardo's Homes, £1 12s. 5d.; St. Dunstan's, £5 11s.; Herts Society for the Blind, £2 9s. 6d.; Mayor's Xmas Dinner Fund, £2 3s. Total, £130 6s. 3d.

THE NEWS—continued.

A Ten-Days' Trades Exhibition held at Scarborough included an attractive display of domestic appliances by the Scarborough Gas Company, and during the final three days of the Exhibition (Oct. 4, 5, and 6) there were housewives' bread and cake competitions in cooking by gas, electricity, and coal fires respectively. Prizes were given in each section, but there was a good deal of popular interest in the product of the rival cooking mediums.

Additional Plant at Sidmouth.—At a meeting of the Sidmouth Urban District Council on Sept. 28, the Gas Committee reported that they had decided to hold a special meeting to consider the provision of an additional gasholder and vertical retort plant, and the removal of the works to another site. The Council resolved to make application in the next session of Parliament for an Act conferring, among other things, further powers on the Council in regard to the Gas Undertaking.

The Newport (Salop) Gas Company have reported to the Newport Urban Council that, as soon as the short-term loans were paid off, it could be definitely stated that the price of gas would be considerably reduced. Consumers were also reminded that the undertaking was now the property of the ratepayers, and those who had not yet taken a supply might note that facilities still existed for free services to be installed. It was stated that there was a rumour prevalent in the town that the working expenses of the undertaking were much in excess of what they used to be; but figures showed that really there was an annual saving of £257. The report was adopted.

Gas at a Bradford Exhibition.—Gas appliances figured at the fourth annual Home and Industry Exhibition, held under the auspices of the Bradford Chamber of Trade, at the Olympia Hall, Bradford, from Sept. 28 to Oct. 8. The Bradford Corporation Gas Department co-operated with the Hygienic Stove Company, Ltd., of St. Thomas' Road, Huddersfield, in the featuring of "Hygienic" gas cookers, boilers, fires, grillers, water heaters, &c., both at the Exhibition itself and coincidently at the Gas Department Showrooms in the city. The British Sa-Vall Company, at a separate stand of their own, featured the "Cookall" one-burner gas cooker, the "Daisy" gas radiator, and the "Grilette" toaster and griller with adapter to transform it into a temporary radiator.

Rotherham's Gas Prices.

The enterprise of the Rotherham Gas Department in the matter of gas pricing has the warm support of Mr. George Helps, Engineer and Manager of the Nuneaton Gas Company, who has written to the "Rotherham Advertiser" expressing his congratulations.

"It is a wonderful proposal," he writes. "At the same time I am able as a gas engineer of many years' practice in this country and abroad to say that in my opinion there is no doubt whatever about the absolute soundness of the proposal. I am confident that if gas can be produced at one penny per therm it can be sold in large quantities for 1½d. per therm. Further, I am confident it can be sold in comparatively small quantities for 2d. to 3d. per therm to the benefit of every householder."

A Commercial and Technical Fuel Bureau.

In the course of a speech at the Conservative Conference at Blackpool on Oct. 7, Mr. R. G. Clarry, M.P., Chairman of the British Road Tar Association, suggested the setting-up of a Bureau to harness the mass of information relating to fuel technology for the use of the industrialist, and to make a continuous national appeal to the public.

"The steady stream of imported liquid fuel, slowly swamping our country and home market," he said, "can be reduced in volume, and in course of time may even be stopped, if we turn to those resources which are ready to our hands. I believe these markets for coal can be regained by educating the consumer, and improving the technique of fuel consumption. The first and comparatively easy step, however, would be to impose an Import duty of 3d. per gallon on fuel oil coming into this country, utilizing the revenue from this to subsidize our coal exports, and develop a more efficient utilization of coal. In this way, we can give immediate relief to the very sorely distressed exporting areas—particularly South Wales and Monmouthshire and the North-East Coast.

"The next step is to give the fuel consumer the information and fuel best suited to his purpose, instead of our present promiscuous efforts to keep his custom, very often with raw and unsuitable coal, under unsatisfactory conditions."

Institution of Gas Engineers.

The following programme has been arranged for the 4th Autumn Research Meeting of the Institution of Gas Engineers, to be held on Nov. 1 and 2 at the Institution of Mechanical Engineers, Storey's Gate, St. James' Park, London, S.W. 1:

Tuesday, Nov. 1

10. 0 a.m. Presentation and Discussion of 9th Report of the Gas Education Committee, 1931-32. (Communication No. 64.)

10.30 a.m. Presentation of Diplomas in Gas Engineering for 1932:
1st Class with Distinction: John Horsfall Dyde, M.Sc., Assoc.M.Inst.Gas E. (Plymouth).
1st Class—Donald Benson, B.Sc. (Bolton).
Charles Johnson (Liverpool).
William Oliver Kirkwood (Sunderland).
2nd Class—Robert Wilfred Harris (Clitheroe).
William Bernard Harrison (Blackburn).
James William Pye (Ilfracombe).
Alexander Tran (Coatbridge).
John Webster (Port Glasgow).
Presentation of the Charles Hunt Memorial Medal in the Diploma Examination in Gas Engineering for 1932 to: John Horsfall Dyde, M.Sc., Assoc.M.Inst.Gas E. (Plymouth).
Presentation of Diplomas in Gas Supply for 1932:
1st Class—Lionel Poulter (London).
2nd Class—Alexander Bujnowski (Glasgow).
Presentation of the Charles Hunt Memorial Medal in the Diploma Examination in Gas Supply for 1932 to: Lionel Poulter (London).

10.45 a.m. Presentation and Discussion of 3rd Report of the General Research Committee, 1931-32 (Communication No. 56), and Discussion of 1st Report of the Gasholder Sub-Committee: The Inspection and Insurance of Gasholders (Communication No. 53), and a Paper on "The Planning of Gas Installations to Conform with the British Standard Specification for Street Lighting," by Frederick C. Smith, Assoc.M.Inst.Gas E. (Gas Light and Coke Company). (Communication No. 54.)

11.30 a.m. Presentation and Discussion of 31st Report of the Joint Research Committee of the Institution and Leeds University. 2nd Report on the Back-Run Process for the Manufacture of Carburetted Water Gas. (Communication No. 58.)

12.30 p.m. Adjournment.

2.30 p.m. Presentation and Discussion of Report on Gases Met with Underground, contributed by Prof. J. S. Haldane, C.H., F.R.S. (Communication No. 62.)

3.15 p.m. Presentation and Discussion of 2nd Report of the Liquor Effluents and Ammonia Sub-Committee. (Communication No. 60.)

4.45 p.m. Adjournment.

Wednesday, Nov. 2.

10. 0 a.m. Report of the Ballot for the election of Members, Associate Members, and Associates.

10.15 a.m. Presentation and Discussion of Report on the Conversion of the Potential Energy of Coal Gas into Radiant Energy, contributed by Dr. Harold Hartley. (Communication No. 63.)

11.40 a.m. Presentation and Discussion of 30th Report of the Joint Research Committee of the Institution and Leeds University. Report on the Sigma B.Th.U. Recorder. (Communication No. 57.)

12.30 p.m. Adjournment.

2.30 p.m. Presentation and Discussion of 32nd Report of the Joint Research Committee of the Institution and Leeds University. Test of the Intermittent Vertical Chambers at Croydon. (Communication No. 59.)

3.30 p.m. Presentation and Discussion of 23rd Report of the Refractory Materials Joint Sub-Committee. (Communication No. 61.)

4.30 p.m. Concluding Business.

Bombay Gas Company's Successful Record.

The Bombay Gas Company, stated a recent issue of the "Financial Times," was registered in 1862 and has been closely identified with the growth and development of the important seaport, which it has served as a public utility undertaking for some seventy years.

For the six years to 1916 a dividend of 7½ p.ct. was maintained, and, with the exception of the years 1928 and 1929, when 7 p.ct. and 7½ p.ct. were paid respectively, the rate has been 8 p.ct. Thus the Company has come successfully through a period of great depression in trade and serious political disturbances with nothing worse than a slight reduction in sales and revenue.

The Company's contract with the municipality has been renewed for a further term expiring in 1935, which, considered in conjunction with the improvement in general conditions, suggests that the Company will at least maintain its past record of earnings. Last year's net revenue exceeded 8¾ p.ct. on the capital. On account of the current year, the usual interim dividend of 3½ p.ct. has been declared.

The authorized capital was increased from £300,000 to £400,000 in 1925, but since 1923 the issued amount has remained at £300,000 in £1 shares, which are officially quoted at 21s. to return approximately 7⅝ p.ct. per annum.

Gas Lighting Preferred.

The Derby Gas Company has just completed a street lighting installation for Mickleover, a village three miles from Derby. The question had been a long-discussed one, and several attempts to secure the consent of the ratepayers to street lighting were unavailing, chiefly because the few objectors demanded a poll under an old statute, and the necessary voting majority could not be obtained.

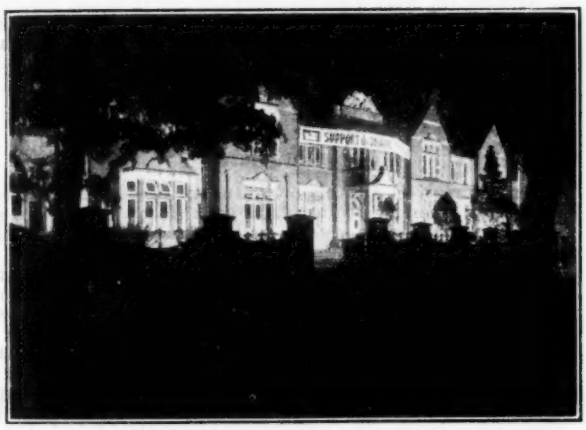
With the constant increase in the population during the past few years the Parish Council sought powers through the Repton Rural District Council, and a parish meeting, the best attended in the history of the village, voted for street lighting by an overwhelming majority.

The Parish Council decided for gas against electricity, and the Derby Gas Company has installed 54 lamps. The rate for lighting will work out at 2½d. in the £ per annum, while had the estimate for electric lighting been adopted the rate would have been 3¼d. per annum.

It is not an innovation for Mickleover to have gas lighting. Through a voluntary lighting committee the village enjoyed street lighting as long ago as 1882, when there were 23 lamps. These were in use until 1895, when the advent of the Parish Council, and the payment for lighting by rate, brought about the abandonment of the lighting.

Floodlighting of Hospital.

This photograph is of the floodlighting by gas of the Smallwood Hospital at Redditch on the occasion of the Hospital Carnival. Although the efficiency of the floodlighting was considerably hampered by the presence of the boundary wall of the hospital grounds, which prevented the placing of the lanterns at the optimum distance from



the building, yet the effect was quite good, and the mellowness of the light compared very favourably with the harsher effect of some of the electricity floodlighting in the neighbourhood. The equipment comprised six lanterns, each fitted with burners serving 12 No. 2 mantles, and the venture, which was the Redditch Gas Company's first attempt at floodlighting, was very successful and received excellent comments in the local Press.

Galashiels Street Lighting.

Gas Company's Offer Accepted.

At a recent meeting of the Galashiels Town Council the Works Committee reported that, following upon their report in connection with the lighting of Bank Street, High Street, Channel Street, and part of Market Street, the Scottish Southern Electric Supply Company, Ltd., gave a demonstration of the lighting of Bank Street at the end of last month. The Committee submitted a letter from the Electric Company, amending their former offer, which has the effect of reducing the capital expenditure for erecting the lamps from £340 to £220, and reducing the cost of supplying the energy to £5 for evening lamps and £8 10s. for all-night lamps, for the season from first Saturday in September to the third Saturday in the following April. The Gas Company had verbally intimated that at their annual meeting in July the price of gas was reduced by 4d. per 1000 c.ft.—from 3s. 6d. to 3s. 2d. The Committee had again given careful consideration to the whole matter, and renewed the recommendation which they made to the meeting on June 13 last, that the improved method of lighting the streets in question by gas should be adopted by the Town Council.

A letter was submitted from the Gas Company stating that the Directors had now decided to offer to make the necessary alterations on the street lamps at their own expense, on condition that a contract for the street lighting be given over a period of seven years.

Councillor Mercer said that, as instructed at the last Town Council meeting, the Works Committee had arranged with the Electric Company to have a further demonstration in Bank Street. That had been carried out, and he thought the thanks of the Council were due both to the Gas Company and the Electric Company for the very efficient demonstrations they had given. The Committee had considered the matter again, and adhered to their former resolution that improved lighting by gas should be adopted. The Committee considered that the streets would be better lit by having a greater number of gas lamps of smaller capacity rather than a smaller number of larger lights as proposed by the Electric Company. At first the Committee had not considered the question of cost, as there was little difference between the two, but as the Gas Company had now decided to bear the whole of the capital cost of altering the lamps that made a difference of £60 in the capital cost, and the difference of something like £103 a year between the electric and gas lighting over this area. They did not see that any case had been made for changing from gas.

Councillor Mercer formally moved the adoption of the resolution, which was seconded by Councillor Torrie, and became the finding of the meeting. On the motion of the Provost, it was unanimously agreed that a letter be sent to each of the Companies thanking them for the trouble they had taken in connection with the demonstrations.

Bamag-Meguin (Great Britain), Ltd.

With reference to the note we published in our issue of Sept. 14 (p. 564) on Messrs. Bamag-Meguin's resonance screens, we should not like our statements to give the impression of a purely German product.

Messrs. Bamag-Meguin (Great Britain), Ltd., of 53, Victoria Street, S.W. 1, the makers of these screens, are, of course, a British Company, and the screens are being built by them of complete British construction, under licence from their Berlin house.

In this connection, it is interesting to note that the first screen built in this country has already been on test and given excellent results, and will be in actual operation within a week or so at the Tinsley Park Colliery, near Sheffield. A further screen is under construction for the Fulham Station of the Gas Light and Coke Company, and this should be in operation within a month or so.

Alsatian Pups Used as Advertising Medium.

Quite a novel method of advertising is the "Gas Ad" which appears on the front page of the Barbados press, and which has been changed daily for the past seven or eight years—sometimes amusing, serious, topical, historical, ofttimes containing some novel attraction which creates more than passing attention. The Barbados Gas Company's recent novel offer of three Alsatian Pups created an additional task for the staff in dealing with callers, 'phone messages, and even letters, and finally the draw.

It is evident that their advertisements are read, and it is to be expected when one never knows what's coming next!

The pups won are of first-class pedigree, and the new owners are to be congratulated on their luck, as these dogs usually sell as high as $25.00 each. The original offer was confined to gas consumers, but many non-consumers asked to have a chance—which of course was impossible—but the Company did obtain one or two new consumers through it, in addition to cementing friendships.

Popular Series of Cookery Lectures.

In co-operation with Messrs. Radiation Ltd. a successful week of cookery lectures has just terminated in the Stoke district of Coventry. The Parish Hall was engaged for this purpose, and lectures were given twice daily with the exception of Tuesday afternoon and Thursday evening. The total attendance exceeded 1200, the maximum being 215 on Thursday afternoon.

The lectures were well advertised in the Local Press and by posters, and four thousand special invitations were delivered by hand to all residents within one mile of the Hall.

The opening ceremony was carried out by Councillor

THE NEWS—continued.

H. H. Cheshire, M.B.E., Chairman of the Gas Committee, on Monday, Oct. 3, and a demonstration of cooking a complete dinner in a padlocked cooker took place on Wednesday, Oct. 5.

A cake baking competition proved most popular, the total number of entries being over thirty. Four prizes were awarded and four consolation prizes.

Many gas cooking appliances were on view around the hall, and great interest was taken in these. A considerable number of inquiries were received, and it is anticipated that business will accrue.

Light and Insight—Illumination and Vision.

In the course of the Ettles Lecture delivered before the Institute of Ophthalmic Opticians on Thursday last, Sir Francis Goodenough, C.B.E., said:

It may be noted that we have no absolute legal definition of good lighting, not even of the "adequate and sufficient lighting" sometimes required by regulations. Illuminating engineers have, therefore, had to feel their own way towards a solution of this problem. They have not yet solved it completely, perhaps they will never do so, as our conception of human needs is always apt to be altered and influenced by the degree of ease with which we can satisfy them. It is evident at the outset that any such definition is ultimately determined by the study of the eye.

It is customary to specify as requirements in good lighting four principal conditions. These are:

(1) Sufficient illumination (measured in foot-candles) on the spot where light is actually needed.

(2) Absence of dazzle or glare, such as may be caused either by unduly bright and unshaded lights within the direct range of vision, or by the troublesome reflection of light into the eye from glazed or polished surfaces.

(3) Elimination of troublesome shadows on the surface to be illuminated such as may be caused either by the person or by surrounding objects.

(4) Constancy in the source of light, *e.g.*, absence of irritating flicker.

To these four main conditions others are sometimes added. Thus, ease of vision may in some degree be influenced by conditions of contrast, though this is really a variant of (2). It has also been suggested that for certain operations quality or colour of light is of importance. Thus the imitation of natural light is of great importance in relation to colour-matching, and we cannot entirely disregard the influence of certain invisible radiations by which the visible light may be accompanied.

Now when we pass to a more precise definition of these conditions we are faced at once by a certain lack of information, such as can only be forthcoming from a knowledge of the human eye, and might, therefore, be furnished by opticians.

Sufficiency of Illumination.

It would seem, for example, that there is no evident manner of ascertaining when the eye is physiologically satisfied, when the light is actually sufficient for its needs. We can, therefore, only feel our way to standards by practical experience. One of the most notable tests of this kind was that undertaken by the Illumination Research Committee of the Department of Scientific and Industrial Research on type-setting by hand. It was shown that efficiency (judged by speed of work and degree of freedom from errors) freely comparable with that attained in good daylight was only reached with an illumination of about 20 foot-candles. Previously, the Home Office Departmental Committee on Lighting in Factories and Workshops had suggested minima of 3 foot-candles for fine work and 5 foot-candles for very fine work; but in practice most up-to-date firms now prefer, in the interests of efficiency, to adopt considerably higher values, 8 to 10 foot-candles being to-day quite usual in modern factories.

In other directions also the tendency towards higher standards has become manifest. The original Joint Committee of the Illuminating Engineering Society recommended a minimum of 2 foot-candles in schoolrooms—a value which I personally considered too low even at that time. Quite recently this report has been revised and a minimum of 5 foot-candles substituted.

It happens not infrequently that a survey of existing lighting conditions makes evident the need for an examination of the eyesight of operators. If, for example, a worker's eyes need correction, as evidenced by the fact that he cannot obtain a clear image of the material which he is examining, no amount of increased illumination will put this right! Yet it is in just those cases that one finds a continual demand for stronger light.

There are also some processes of very close work which almost invariably demand the use of magnifying glasses—even by persons with comparatively good vision. Such processes as "linking" hosiery, sorting and mounting lamp filaments, drawing in warps in the cotton industry, which have been the subject of study by Mr. H. C. Weston, of the Industrial Health Research Board, are cases in point. They illustrate the importance to the illuminating engineer of the optician's work, for it is in just such cases as these that the lighting is apt to be unjustly blamed when it is really spectacles or other aids to vision that are needed!

Gas Inspection Services in Canada.

The report on the Electricity and Gas Inspection Services of Canada, covering their activities during the fiscal year ended March 31, 1932, states that the total number of gas meters tested for the year was 114,181, a decrease of 19,678 from the previous year. There were 20,271 new meters tested as compared with 32,397 for 1930-31. The number of meters in use on manufactured gas on March 31, 1932, was 540,277, an increase of 9368 over the previous year.

During the past year approximately 17,896 million c.ft. of manufactured gas were sold, a decrease of 370 million c.ft. The manufactured gas sold consisted of the following:

	C.Ft.
Carburetted water gas	4,267,100,000
Coal gas	6,386,000,000
Coke oven gas	7,235,500,000
Acetylene gas	790,000
Butane gas	6,600,000

During the year 3707 calorific tests were made throughout the Dominion of Canada and the average heating value was found to be 493·3 B.Th.U. per c.ft. The standard required by regulation is 450 B.Th.U. per c.ft.

Mr. J. T. Haynes Addresses Rotherham Rotarians.

An address on the opportunities of developing gas services was given by Mr. J. T. Haynes (Rotherham Borough Gas Engineer), at a recent well-attended luncheon of the Rotherham Rotary Club.

After giving some striking figures relative to the magnitude of the Gas Industry, Mr. Haynes said: "It is popularly supposed that gas is fighting for its life in competition with electricity. Nothing of the sort; it is fighting a much greater and more important battle—a national one. The coal industry, in so far as it is dependent on the use of raw coal as a fuel, is badly hit by foreign oil. This change-over in national fuel is one of the greatest causes of the depression in the coal mining industry—a basic industry affecting directly all other industries—and coal, as coal, cannot hope to recover the loss.

"This country has for a long time been dependent on foreign food and now it is becoming dependent on foreign fuel. Surely this is heading for national extinction. The Government has fathered a "Back to Coal" movement and intense investigation is being made to find means of using more coal—hydrogenation, low-temperature distillation, and other methods to produce oil—and gas is available already. Would it not be better to encourage the increased use of gas, instead of oil? Why should oil be imported without a tariff? Petrol is taxed but oil which is stifling the coal industry is allowed to come in free. It makes one wonder.

"Everything that oil fuel can do, on land, can be done better and with less nuisance by gas. Gas offers to the industrial user easy transportation without the difficulties of thick fuel oil in cold weather, and no storage is necessary for gas. The combustion of gas is easily arranged and is simple to control. Gas makes possible a wider range of temperatures, more flexible atmosphere control, and is cleaner than oil, and at 2½d. per therm it is cheaper than oil.

"Gas is coal applied scientifically, and one of the greatest factors in the saving of the coal industry is the greater use of gas."

Mr. Haynes also gave some interesting details in regard to the application of compressed coal gas for transport purposes. At the present time, he said, the passenger 'bus services of the country used something like 100 million gallons of petrol per annum. To displace this 25,000 million c.ft. of gas would be required making a demand for a further 1½ million tons of coal. Still more would be required for heavy road transport.

B.C.G.A. District Conference at Dumbarton

Celebration of a Centenary of Gas Supply

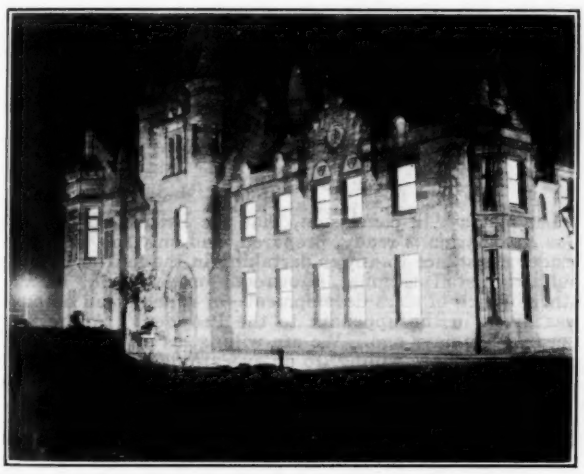
In connection with the centenary of the Gas Undertaking in Dumbarton, an exhibition of gas-lighting, cooking, and heating appliances was held in the Burgh Hall there from Monday, Oct. 3, till Saturday, Oct. 8, inclusive. The exhibition, which was officially opened by Sir Ian Colquhoun, Bart., D.S.O., was largely attended by the general public and by manufacturers in the district.

It was a happy idea on the part of the British Commercial Gas Association to arrange for a Scottish District Conference in the Royal Burgh. The conference was well attended by delegates from all parts of Scotland. The proceedings opened in the Burgh Hall with an address of welcome to visitors and delegates from Provost Bilsland. Thereafter an adjournment was made to the High Street Church Hall, where luncheon was provided by the Dumbarton Gas Committee.

Provost JOHN BILSLAND, who presided at the luncheon, said the municipality had been honoured by Sir Francis Goodenough consenting to come to take part in their centenary celebrations.

LOOKING TO THE FUTURE.

Sir FRANCIS GOODENOUGH, proposing the toast of "The Town and Trade of Dumbarton," said that the progress of the Gas Industry in recent years had, indeed, caused much surprise to those who thought that with the advent of electricity the Gas Industry was doomed to—perhaps a lingering but, at least, a certain—death. The latest official figures showed that during



In connection with the Dumbarton Gas Centenary the Dumbarton Municipal Buildings were floodlighted by gas. Here is a photograph of the scene.

the past two years there has been an increase in the sale of gas in the British Isles of no less than 10,000 million c.ft.—more than enough to supply the City of Gasgow for a year—while the increase in the sale of gas had more than doubled since 1901. This was a striking record for an Industry now 120 years old. Among its most recent developments gas-fired central heating plant was growing in use in larger homes, and was widely chosen for public buildings, theatres, and offices. In institutions, hospitals, and schools extensive use was made of gas for water heating, heating, and culinary operations.

But they of the Gas Industry were not content to rest on their oars, complacently enjoying the laurels of the past. It was looking to the future with confidence because it was looking to the future and not contenting itself with the present or the past. Its technical organization had been keyed up to a high degree of efficiency. Its administrators, conscious of their responsibilities in the conduct of a vast public utility, had diligently explored, and were exploring, every way in which gas could serve the factory and the office as well as the home. They were planning ahead so that the Gas Industry could take its full share of the trade revival that was surely at hand.

"In proposing 'Prosperity to the Town and Trade of Dumbarton,'" concluded Sir Francis, "let me congratulate the town, especially on its centenarian trade of gas supply and upon the efficiency of its administration to-day under the able guidance of my friend, Mr. James Bell, and wish him and his Undertaking many very happy returns of the day. I have much pleasure in coupling with the toast the name of Provost John Bilsland, and wishing him and the historic Burgh over which he is presiding long life and prosperity."

Provost BILSLAND replied to the toast.

Ex-Provost GARRICK, proposing the toast of "The Gas Industry of Scotland," said that in the 130 years which had elapsed since Murdoch lit up the works of his employers at Birmingham, the story of the Gas Industry had been one of continued progress. The satisfactory state of the Industry was largely due to the Associations formed in the interests of the producer and consumer. Gas and its allied industries were doing much to make unemployment less serious than it might be. Few ratepayers realized the large contribution which gas undertakings made to local rates. Were they on the same basis as other industrial concerns, the cost of gas to the consumer in many cases could be materially reduced. The high technical and administrative skill shown by those engaged in the Gas Industry was bound to bring the success which was its due.

Mr. A. S. NISBET, President of the North British Association of Gas Managers, replying to the toast, said that in Dumbarton the Gas Undertaking had been loyally backed up by the Municipality. Dumbarton had splendid gas-works, and the streets were excellently lighted.

ADDRESS BY SIR FRANCIS GOODENOUGH, C.B.E.,

Executive Chairman of the B.C.G.A.

What I want to say to this Conference to-day—and I say it as Chairman of your *British* Commercial Gas Association, not as an Englishman venturing to give advice to his Scottish colleagues—is, if you please, not to be regarded as in any way a criticism, but as an examination of facts for the purpose of providing a basis of thought for us all for the future.

The main fact I want to examine and bring to your notice is this:

I had the pleasure of attending the recent meeting in Ayr of the North British Association of Gas Managers—not, be it noted, of Gas "Engineers," but of Gas "Managers"—and of listening to an excellent address from Mr. Harper, a very valuable paper by Mr. Jamieson, and a most interesting discussion on that paper.

Yet, throughout the proceedings, interesting and valuable as they were, there was, it seemed to me, nothing (apart from a reference to the sale of coke) to indicate that the members were conscious of the chief problems that, at this juncture in the history of our Industry, should be occupying the minds of gas managers, as distinct from gas engineers, and occupying them very fully and seriously.

There was an almost complete concentration on technical problems and their financial aspects.

The only central organization that appeared to exist in the minds of the members was the Institution of Gas Engineers. Of that Institution no one appreciates the value more clearly than myself, but its sphere lies outside the most urgent problem of to-day. The work of the National Gas Council, *vis à vis* Parliament, the Board of Trade and the Ministry of Health, or the work of the British Commercial Gas Association on the development and propaganda sides of the Industry, were not, I gathered, present in the minds of the North British Managers.

I had a very cordial welcome from the members, as always, but I clearly had no possible relation to the topics of the occasion.

The certificates presented in connection with education numbered 6 in Gas Engineering and 1 in Gas Supply—7 for the whole of Scotland, and only 1 of that number in Gas Supply! Surely that is not a true reflection of the importance attached to the Gas Supply side of our Industry in Scotland, or of the value placed upon education in the very home of educational effort and efficiency!

But, furthermore, was there any reference to the Course in Domestic Gas Salesmanship? Are there, indeed, in Scotland, any students as yet in that Course—a course which has been taken, with marked and continuing advantage to them and their undertakings, by over 1500 students South of the Border?

THE VITAL AND DOMINATING ISSUE.

There was no reference whatever to that subject; and that was only one small, though significant, symptom of the fact that there was an almost complete ignoring throughout the meeting of what to me appears the vital and dominating issue that confronts the Gas Industry to-day: The problem of selling our Service to the public more effectively

and completely, and so (1) maintaining, and (2) increasing, the output of gas.

I want to say, with all the earnestness and plainness and strength I possess, that this problem of perfecting our service to the public, and of selling it to them by the most efficient and effective means possible, should and—if we are to progress, indeed, if we are to survive as an industry—must *dominate the minds and constantly possess the thoughts* of every gas manager and gas administrator to-day and for many days to come.

Unless we awaken quickly to the perils and needs of the times, and take all necessary means to enable us to meet and overcome them, *as we can if we will*, we shall awaken too late.

I don't want to be melodramatic in anything I say to you, but it is only to remind you of sober truth to say that there are no two words in our language containing more possibility of tragedy than those words "too late;" and I am gravely concerned about the present attitude of mind in some quarters in the Gas Industry. That attitude I mean which appears to find satisfaction in saying that we are "rather more than holding our own." That may be ground for relief in days of widespread industrial depression, but we want to have a different standard in our minds whereby to measure our satisfaction or lack of it.

Why should we not be expecting an average annual increase of output of 5, 6, 7, or even 10 per cent.? Is it impossible—is it out of the question? Are all the rooms in all the houses on our districts fitted with gas fires where they could be used to advantage? Is there a gas water heater in every place where it could be used with satisfaction to the customer? Is every house supplied with gas that is within reach of the mains? Has every effort been made to increase the sale of gas that could be made by publicity, by canvassing, by good service to present consumers?

I doubt if many of us could answer "Yes" confidently to all those questions, though I know that much good work has been done in the field of sales development and service organization by Scottish gas managers.

Why do I raise these points and raise them so strongly—I hope none of you feel I am raising them in too critical a manner—now? And what positive suggestions have I got to make?

Business Men First.

I bring forward to-day as immediately urgent and grave the question of whether we regard our occupation as the practice of a Technological Profession or *as the conduct of a Business on Commercial Lines*—for that is the issue in brief—because I believe that we are entering, have indeed entered, upon a new era in which we shall decline and diminish and ultimately come to desperate straits unless we adopt the new ideas and new methods that the new era demands—unless we realize that a gas *manager* in the year 1932, and in the years to come, must be first and foremost and very effectively *a business man*, devoted to the commercial conduct of a competitive business; and that all the technology, all the chemical science, all the gas engineering in the world will avail us nothing unless we can sell, in increasing measure, the product of our technical and chemical skill.

We who are Managers and Engineers and Chemists all in one must forget sometimes that we are Gas Engineers or Gas Chemists and think of ourselves all the time as Business Men engaged in the sale of gas—the purified essence of coal—and of coke and other bye-products.

We must realize that every gas official, every gas employee, every gas administrator, every gas shareholder, derives his income—every penny of it—from the money paid by the purchaser of gas; and that unless purchasers on a sufficient scale are forthcoming the whole organization must perish.

Why this alarmist attitude and talk, some one may ask—what is there new in the situation?

My answer is, first, that there is nothing new in my emphasis on the importance of salesmanship to the Gas Industry; I have tried to preach that doctrine for a good many years, and my realization of that importance has grown with every recent year of study of the situation.

My answer, secondly, is that for some weeks past I have been travelling over Scotland and England pretty freely, and everywhere the evidence strikes the eye—in many places it offends the eye and saddens the soul: as in some of your glorious glens and on the shores of your lovely lochs—everywhere the evidence is to be seen of the growth of the Electric Grid, which is well on its way to completion.

What of that? you may say; haven't you just been saying, to the evident annoyance of the Electricity Board, that the Grid will prove a financial White Elephant? What are you specially worrying about if that be the case?

I worry, and you should all worry, because, if, as I have good reason to believe, it will be difficult if not impossible to make the Grid produce anything but heavy deficits when its full capital charges have to be met, then a great effort, an effort backed by bureaucracy to the fulness of its power and by state departments and ministers (unless they decide to fight shy of a dangerous job) a full-blooded effort will be made in the not distant future to get business for the Grid by intensive advertising, propaganda, and canvassing.

Now that is nothing to be afraid of; nothing to worry about; something rather to be welcomed, because to be alive and fighting is much more interesting and amusing than being half asleep on an easy, do-itself job; if—but only if, and it is a fundamentally important "if"—we are so popular with our customers through completely efficient service that they are our friends who would be sorry to discontinue being our customers, very sorry to see us badly hit by competition.

Is not that a very big subjunctive if?

Let us ask ourselves some pertinent questions.

Is every one of our customers perfectly satisfied with the quality, purity, and price of our gas? Does every one of them get an ample pressure of gas whenever he or she most wants an ample supply? Is every piece of gas-consuming apparatus on our districts in perfect working order—every gas fire perfectly ventilated; every gas cooker the housewife's pride; every incandescent gas burner maintained in perfect lighting order?

In short, again, is every customer a really satisfied customer? Is every one a customer who might be? Does every customer use as much gas as could be used with advantage to him in his particular premises?

Now, as I have said, I know that many North British gas managers have done much to perfect their service, to educate their public, and to train their employees, and I do not want to be misunderstood as putting these questions without knowledge, sense, or discrimination.

But I do urge, with all earnestness and sincerity, everyone to examine his own mind, his own methods and organization, dispassionately, cold-bloodedly, as if he were examining the mind, methods, and organization of another, and to ask himself the question: Am I prepared to meet, with a light heart, on account of a perfected organization, intensified competition in the near feature, or is there anything more I can do to strengthen my undertaking in the esteem of its customers so that they will be allies and not enemies when others seek to win them away?

Help of the B.C.G.A.

Let me say, in conclusion, that the British Commercial Gas Association is ready, prepared, and only too willing to render assistance to any undertaking in the matter of local publicity, staff training, showroom organization, or any other branch of sales development—of which a full account was given in the appendix to the President's Address at Leeds a few days ago. We are willing, as all the National organizations are willing, to do everything possible to help the Industry as a whole and to help every undertaking help itself; but no national or district organization can do any undertaking's work for it. Every unit of our great Industry must play its own part, and my confident belief is that, once the need for action is realized, the Gas Industry through its units and through its combinations of units will win through to greater prosperity and progress in the service of the country than has ever been witnessed before.

Discussion.

Sir W. E. Whyte, Chairman of the Scottish Executive Board of the National Gas Council, said he thought they were all in agreement with the expressions of Sir Francis Goodenough who was neither pessimistic nor apologetic. There never was a time when plain speaking was so much needed as now. Sir Francis had an unsurpassed commercial experience, and his ideas could be accepted as sound and convincing. Reference had been made to gas as a municipal monopoly. It was not a monopoly now. Many realized the competition from electricity—spoiled and petted child of the illumination and power world. The Gas Industry had not been strong enough in declamation. Governments had given direct and indirect support to electricity, while gas has been left to flounder along as best it could. The Gas Industry has not been as progressive as it might have been. Municipal economy was holding up development; it was preventing provision for the future; it was doing the country a disservice.

Sir Francis had said that the B.C.G.A. would welcome suggestions. It occurred to the speaker that it would be a good thing if they had in Scotland a Scottish Committee of the Association. While the publications which came from London were admirable, if they were conceived in Scotland to attract the Scottish mind they would do more good than at present. A Scottish Committee getting suggestions and information from different districts would be able to propound definite suggestions to send to the headquarters in London. Sir William said he would be the last to suggest separation from London; they must have unified work, but that unity could be strength-

ened by suggestions received on how to appeal to the people in Scotland.

Ex-Bailie CARMICHAEL said that in Greenock they had a small profit on the Gas Undertaking, against a debit for electricity.

Mr. J. W. MCLUSKY (Glasgow) suggested that Sir William Whyte did not know that they had a Committee in Scotland which met occasionally, but not often enough. He thought oil would be the most dangerous competitor in the future. If there was to be a revival in trade they should prepare for it now by seeing that mains and service pipes were extended and kept in good order. They need not look to the State for aid in that work.

Mr. R. D. KEILLOR (Greenock) said he had every sympathy with the remarks of Sir Francis about improvement of salesmanship, for he had actually tasted of the fruits of the salesmanship course. It was a simple fact that one could plan a sale. If one wanted to sell a water heater it was not enough to state the cost. It was a different thing when one could express and impress what service it would give day after day. It was not then a case of handing over so much iron for so much money.

Sir FRANCIS GOODENOUGH mentioned that there was a Scottish Committee consisting of representatives of Scotland on the General Committee of the B.C.G.A. They met only once a year, but were looking forward to having more meetings.

Mr. JAMES BELL (Dumbarton) explained how the local gas sales business was conducted. They had adopted a voucher system perfected by the central organization. Those who had not adopted that system should go in for it. They had a complete record of appliances, meters, fittings, and everything else.

Mr. H. G. RITCHIE (Falkirk) said there ought to be more meetings of the Council of the B.C.G.A. During the past twelve months he had not been called to a meeting.

Mr. ALEX. DOW (Galashiels) mentioned that his Company advertised in local papers twice a week. They had secured a seven-year contract for the lighting of the town, after a serious fight. The Electricity Company approached the Town Council, but failed in competition with gas. A second opportunity was asked for by the Electricity Company, and when it was granted they failed again. The population of the town had decreased, but gas output had increased 100 per cent. in twelve years.

Sir FRANCIS GOODENOUGH said that a low price was not the best selling point. Good service was better. They could get more sales with 3s. gas and good service than with 2s. 6d. gas and bad service. They wanted both good service and cheap price. Their advertising should not be anti-electricity, but pro-gas.

Mr. J. W. MCLUSKY referred to the presence of Mr. J. C. Walker, General Secretary of the B.C.G.A., who was always working hard. They regretted the absence of Mr. W. M. Mason; and he proposed that they send a message to him wishing him well and hoping for his recovery.

The proposal was carried with acclamation.

A CENTURY OF SERVICE IN DUMBARTON.

Gas was first brought to the town of Dumbarton in 1832, in which year the Dumbarton Gas Light Company was formed with a capital of £1000. In those early days gas was only used for lighting, and its price, when a meter was used, was 12s. 6d. per 1000 c.ft.—a formidable figure compared with the price to-day. At the end of eighteen months the Company had made a profit of £66 8s. 3d., out of which a dividend of 5 per cent. was paid.

By 1847 the price of gas had fallen to 8s. 6d. per 1000 c.ft., and new plant had to be installed to cope with the growing area covered. The Company continued to prosper, and in 1873 it passed from private management to the control of the Town Council. At that date the yearly output of gas stood at 15 million c.ft., and the number of consumers was 2056.

After 1873 the rate of progress was even more rapid. The invention of the incandescent mantle led to a more general use of gas lighting, but more important still was the realization of the possibilities of gas as a heating agent. By 1913 the annual output of gas was 95,466,000 c.ft., and the total number of consumers 4860.

In 1919 a new era of expansion began with the erection of the new gas-works. A site of ten acres on the Dumbuck Estate was chosen, and the work was completed in 1923 at a cost of £137,000. In 1926 the gas showrooms were opened, and the steady growth of the Undertaking can be gauged by the fact that the annual output of gas, which stood at 121,619,000 c.ft. in 1923, had reached the figure of 174,528,000 in 1931.

GAS AT THE NORTH LONDON EXHIBITION

A very fine display staged by the Tottenham and District Gas Company at the Alexandra Palace, Muswell Hill

A prominent display of gas appliances exhibited on a stand of striking proportions and in a most attractive layout has come to be expected of the Tottenham and District Gas Company at the North London Exhibition, opened on Oct. 5, and which is held annually at this time of the year at the Alexandra Palace, Muswell Hill. On the present occasion the display comes fully up to expectations, and from many aspects exceeds the records set up by this progressive Undertaking in previous years.

The Exhibition was this year declared open by a member of the public called upon at random, and the honour happened to fall upon Miss Steer, who is the daughter of Mr. W. J. Steer, the London Manager of Messrs. Willey & Co., Ltd., of Exeter.

The "Gas Pavilion," as the stand is appropriately styled, is situated just within and extending right across the main entrance to the Palace, so that everyone either entering or leaving the exhibition must pass through the gas exhibit. The front of the stand as approached from the entrance is imposing and is efficiently floodlighted by a series of Sugg's directive gas lamps, while the whole is brilliantly and artistically illuminated by a comprehensive range of gas lighting fittings, including further Sugg's lamps, and fittings by the Nico Light Company, Ltd. (of 19, Farringdon Avenue, E.C. 4) and by Messrs. Falk, Stadelmann, & Co., Ltd. (of Farringdon Road, E.C. 1).

The stand is arranged in sections by the Tottenham and District Gas Company in co-operation with a number of leading firms in the Industry, thus showing the public a complete range of gas appliances for domestic purposes, while around the walls are a number of appropriate gas slogans, of which the Tottenham Company make a great point at all their exhibitions and displays.

Appliances by Messrs. R. & A. Main, Ltd., occupy a prominent position and are shown to good advantage arranged on either side of a central setting of a beautiful example of the "Gloria" inset fire in an attractive surround. Fires, cookers, radiators, and water heaters by this firm are all displayed, including the "Unimain" radiator and the improved type of "Romain" panel heater in old gold finish, in addition to "Mainscreen" gas fires and the "Thermain" water heater.

A section is devoted to a display of Dean washing machines, the "Acme" wringer, and gas clothes drying cabinet, and demonstrations of these are continuously in progress. There are also continuous demonstrations of ironing.

Examples of high-temperature coke fires are in operation in close proximity to the stand in "Metro" and Kempton grates, and the amount of heat given out by these is noticeable by all who pass near them. A comprehensive display of refrigerators by Electrolux, Ltd., ably demonstrates what gas is doing in this direction, models being shown from the large sizes down to the comparatively new 'Freezolux" Minor air-cooled model. Messrs. Ewart & Son, Ltd., of Euston Road, N.W. 1, have a section in which a wide range of their water-heating appliances is exhibited, many of these being in working. A particularly attractive little lavatory basin water heater is the "Allhot," finished in white enamel, while another popular heater is the "Tottenham" bath heater, of which a large number have recently been supplied to the Enfield Council in connection with a new housing estate.

COOKERY DEMONSTRATIONS.

An extensive section of the stand is set apart for cookery demonstrations, which are carried on at intervals throughout the period the exhibition is open. A selection of modern gas cookers is arranged round this section, which is always packed during the lectures, these being arranged by the Tottenham Company's own expert lady demonstrators. Various up-to-date gas cookers are being used alternately for the cooking, among these one of the Vulcan Stove Company's new glass-fronted oven models. Between the cookery lectures an artist keeps the public entertained with lightning sketches of topical subjects appertaining to the activities of the Gas Industry.

A new section this year is the "Technical and Indus-

trial " section, in which are exhibited examples of small industrial furnaces, a Bonecourt boiler, a large " Teuton " gas fish-frying range, an " Ideal " gas boiler in mottled enamel finish, an Incandescent Heat Company's furnace, in operation, a mantle display by Messrs. Lighting Trades and the Welsbach Light Company, Ltd., and a mantle shocking machine, which demonstrates the test to which the Tottenham Gas Company put all their mantles before sending them out on to the district. There is a chemical exhibit, demonstrating in a simple yet striking manner the products obtainable from coal.

An Ingenious Thermostat.

In this section is a device which should prove useful to cookery demonstrators. It was fitted up by a member of the Tottenham Company's Works Staff, a standard " Spersom " thermostat being used as the basis. On a large circular dial are marked off the various foodstuffs to be cooked in the oven; and a pointer on the dial is connected to the oven thermostat. The whole of this industrial section is illuminated by Sugg's factory lamps.

Another section of the exhibit is devoted to Parkinson Stove Company appliances, among which the " Curvex " fire is prominent. Other of this firm's exhibits include their " Luminous " radiator, " Pano " inset gas fire in attractive surround, the new " Pearl " geyser in chromium finish, together with examples of gas cookers and other apparatus. Messrs. W. Sugg & Co., Ltd., have an interesting section, where are displayed examples of their " Red Sphinx " fires, the new size of " Eton " cooker, gas pokers, and attractive lighting fittings. In the domestic heating section is a comprehensive range of fires and radiators, many of the former being finished in the new " Foochow " colours, by the process of Messrs. Donald Macpherson & Co., of Batsworth Road, Mitcham. The Tottenham Company have installed their own plant for this colour treatment of gas fires, and an extremely attractive selection is available. The " Console " radiator by Messrs. John Wright & Co., Ltd., is in evidence in a very nice dark green finish. A large number of enamel-finish gas cookers of all sizes are displayed, the products of various manufacturers in the Industry, providing a choice to suit all requirements—among these, Radiation Ltd., Main's, Parkinson's, Falk's " Newholm," and Cannon's " Cambridge " in an attractive mottle finish, the wearing qualities of which are understood to be extremely good. The last-named Company are also the makers of the new " Beacon " radiator.

A further section contains a number of Whitehouse chromium-plated lighting fittings of both bracket and standard types, which should add considerably to the prestige of gas lighting. Other sections are devoted to displays of gas water heating appliances of all types, including those for bath, lavatory basin, and sink. A new model " Ascot " sink appliance supplies water either straight from the main, or hot, cold, or mixed by means of a special mixing device. A kitchen setting shows an example of gas cooker and " Ideal " coke boiler side by side, and also a " Sunhot " storage heater, which the Tottenham Company are installing on a 6d. per day all-in rate. A bedroom setting shows the " Pano " inset fire set flush in the wall in a corner in an attractive surround and also a gas bedside table lamp. A model bathroom contains an " Ascot " multi-point water heater, feeding the bath, as well as lavatory basins in both bathroom and bedroom, while, in addition, a smaller " Ascot " heater is shown supplying independently the needs of the basin. An example of the Davis clinical lamp is also to be seen here.

In all, the Tottenham Company have supplied gas to thirty-five other exhibitors throughout the exhibition for various purposes.

Another Cooking and Heating Display.

Messrs. Hobbs Wilson, of Wood Green, who do a considerable amount of work in the gas and coke line, have, as on previous occasions, a prominent stand, where chief among the exhibits are " Ideal " coke boilers, by the National Radiator Company, including the new " Cookanheat " coke and gas apparatus. This interesting appliance is in mottled enamel finish, and embodies the normal coke boiler with oven alongside, with the addition of an independent gas burner to heat the oven when the coke fire is not in use, or as an auxiliary means of heat when the fire is low; there is also a gas ring set in the hotplate, while a new type of gas poker as a standard attachment for igniting the coke fire is included. " Neo-classic " radiators in coloured finishes are in evidence, together with examples of " Metro " coke fire and " Flambeau " imitation solid fuel fire operated by gas, with additional luminous burner to provide a flickering flame on top—this by Messrs. Sidney Flavel & Co., Ltd.—and also their imitation log gas fire. An ingenious device in connection with one of the coke fires is the provision of a glass flue to show how completely smokeless is the modern coke fire. Cookers by Messrs. Flavel are also shown on this stand, which is illuminated throughout by Sugg's directive gas lamps. The Aladdin double gas griller is another interesting little appliance shown in operation on this stand. This only measures 9 in. by 6½ in. by 9 in., the cooking temperature being derived from the hotplates heated by gas. Both sides of the food are cooked at once.

The Exhibition as a whole is an excellent one from the gas standpoint, and illustrates the versatility of gas in a very admirable manner, which cannot fail to impress visitors. The Tottenham and District Gas Company, and those firms co-operating in the production of this fine effort, are certainly to be congratulated.

CONTINENTAL NOTES

THE NEW GAS COMPRESSING STATION OF THE PARIS GAS COMPANY.

A. Pignot, in " Journal des Uzines à Gaz," 1932, 56, 469-474 (Sept. 20), describes the new gas compressing station of the Paris Gas Company and gives an account of some of the investigations carried out there.

There are three compressors of capacities 1400, 2400, and 7000 c.ft. of free gas per hour. The largest is a horizontal four-stage Buckardt compressor with inter-stage cooling, and the working pressure is 200-250 atmospheres. The pressures attained in the successive stages are respectively 2·5, 10-12, 45-50, and 150-200 atmospheres. Means are provided at each stage for the removal of condensate and, in addition, there is an extra purging bottle packed with Raschig rings to ensure that no condensed liquid enters the compressed gas cylinders. The compressors are belt-driven, the motors being contained in a house isolated from the compressor building.

Six large cylinders, each of 18 c.ft. capacity, constitute an accumulator and provide a reserve of some 20,000 c.ft. of free gas at a pressure of 200 atmospheres. The compressed gas main is provided with five valves enabling five lorries to be charged simultaneously by use of flexible, high-pressure, steel hose.

The station includes, also, equipment for testing gas cylinders hydraulically to a pressure of 300 atmospheres and for testing pressure gauges.

The power consumption for compressing gas from atmospheric pressure to 200 atmospheres is 7 KW.-H. per 1000 c.ft. of free gas. The temperature of the gas does not rise beyond 212° F. when cooling water at a temperature of 55° F. is employed, the temperatures after the first and second stages being about 167° F. and 207° F. respectively and less than 122° F. after the third and fourth stages.

At each stage, due to formation of condensates and rise in temperature, the calorific value of the gas falls. Thus with 480 B.Th.U. gas, the calorific values after the successive stages are 452, 442, 441, and 439 B.Th.U./c.ft. respectively.

The consumption of lubricating oil is approximately 23 gallons/million c.ft. of gas. The condensates obtained consist of water and a lighter oil which readily separates. The following particulars are given:

—	1st Stage.	2nd Stage.	3rd Stage.	4th Stage.
Condensate collected. Gallons/million c.ft of gas—				
Water	10	9	2¾	Traces
Oils	25	85	28	½
Sp gr. of the oil	0·91	0·88	0·87	
Initial boiling point, °C.	67	61	29	24
% distilling to 80° C.	2·5	4	32	21
100° C.	11	54	88	74
120° C.	21	89	96	
150° C.	30	95		
170° C.	37			
Atmospheric pressure (mm. Hg) during the distillation	762	756	751	770

From the oils, crude benzole amounting to 85-95 gallons/million c.ft. of gas is obtained and debenzolization of the gas is complete.

GLOVER-WEST VERTICALS - - IN FRANCE* - -

The Installation at Beauvais

The gas-works at Beauvais was designed in 1866 on excellent lines by its founder, M. Francois Alavoine. Continually improved, the original installations were satisfying the demand even in 1930. But, even if the settings and ancillary apparatus had been developed by the addition of all the improvements which were applicable to them, it was evidently impossible to modify them sufficiently to keep up with the radical alterations in gas-making technique which have recently taken place, especially since the war. The horizontal retorts, particularly, had indeed been equipped with a hot-coke conveyor, transporting this residual direct to a system of mechanical screens. But the retorts were still charged by scoop and discharged by means of rakes. The plant had become so out-of-date that the maintenance of the works as a whole had become a matter of considerable difficulty, necessitating much labour and consuming too much fuel to extract from the coal what it was capable of yielding.

The contracts with the Municipality having been renewed in 1930, the Beauvais Gas Company were in a position to contemplate the investment of new capital in the works, and decided on a complete transformation, taking advantage of all the progress that has been made in modern gas-works design.

The carbonizing plant claimed first attention, and it was decided to construct an entirely new installation. After having studied all modern systems of retorting, the Directors decided upon that of continuous distillation, as being most in accordance with the general principles which govern all modern industrial processes—the substitution of power for manual energy, the complete suppression of arduous and dangerous labour, and, above all, that continuity of process which is so suitable to the chemical reactions which constitute the distillation of coal and the simultaneous production of water gas.

Particularly Attractive.

Among vertical retorts those of the Glover-West system were particularly attractive. The dimensions of the units, retorts of about three tons daily throughput in groups of two, seemed best suited to the requirements. Six of these retorts would suffice for the demand in normal periods, stoppages for scurfing eliminating only a relatively small fraction of the total capacity. Finally, the standard Glover-West setting, in which the waste gases proceed directly to the waste-heat boiler, without passing through a regenerator, and, therefore, without having lost any considerable proportion of their heat, results in the production of a quantity of steam sufficient not only for the demands of the retorts themselves but with a surplus which can be used for the dehydration of tar, or for use in certain small engines, reducing the consumption of electricity.

The Glover-West system was, therefore, adopted, and the contract was passed to the Cie. Gle. de Construction de Fours in April, 1930, together with that for the construction of a coke screening plant. The Cie. pour la Fabrication des Compteurs was entrusted with the supply of the ancillary apparatus. The complete installation was designed for the manufacture and purification of 15,000 cub.m. (530,000 c.ft.) of gas per 24 hours.

Producers and Retort House.

The brickwork of the producers and that of the retorts rests upon reinforced concrete piles 6 metres in length (about 20 ft.) driven into a thick bed of gravel, these foundations being of sufficient dimensions to permit of the ultimate construction of one more producer and two more retorts.

The settings are heated by a battery of three step-grate producers built in a separate block. The fuel gas is taken from the producers into a common circular steel flue with branches to each of the six uptakes of the settings. The retorts are heated in the usual manner, with seven superimposed combustion chambers, and three waste-gas circulating chambers arranged around the upper portion of the retorts.

The same building encloses the producers and the retort settings, and the upper portion is arranged for the accommodation of the coal and coke handling plant, the pumps for the supply of ammoniacal liquor and water to the gas collecting mains and boilers respectively, the waste-heat boiler with its superheater, and a tar-separating tower.

[Photo. by F. Harand, Paris.

The coke screening unit and reinforced concrete storage hoppers at Beauvais.

Coal and Coke Handling.

The coal is discharged from railway wagons into swinging lorries drawn by a tractor, and is weighed on arrival at the works on a 20-ton weighbridge.

The lorries are emptied through bottom openings either on to an elevator to the coal stores, or into a skip of a capacity of 1500 litres, with a double outlet, on an inclined hoist for the supply of:

(1) At the top stage, the coal bunkers by way of a push-plate conveyor, or
(2) At the bottom stage, the hopper which receives the coke for the producers.

These operations are effected by the manipulation of a simple electric contact, which sets in action the hoisting, discharging, and returning automatically of the skip to the ground level.

As a precaution a lift of 1300 kgs. (about 25 cwt.) capacity is provided to serve either for the charging of the producers or the coal bunkers, and also to afford easy access to the different platforms of the installation. The filling of the producers is effected by a skip running on a mono-rail and taking its supply from the previously mentioned hopper. The retort bench equipment and operation are in accordance with standard designs and practice. The operation of the retort bench is effected very easily by no more than two stokers.

Waste-Heat Boiler.

The waste gases coming from the settings at a temperature of about 1000° C. are passed through a vertical boiler of the Field type. The steam is raised to a temperature of 375° C. by means of a superheater, and conveyed by insulated pipes to the reducing valves, which regulate its admission to the retorts. The feed water for the boiler is preliminarily purified by a quantity of carbonate of soda.

* From "West's Gas."

[*Photo. by F. Harand, Paris.*

THE FINE MODERN SHOWROOMS OF THE SOCIÉTÉ DU GAZ DE BEAUVAIS.

and is diluted in a receptacle placed above and equipped with an automatic supply regulator.

When it is desired to vary the quantity of steam produced in the boiler it is only necessary to manipulate the two dampers placed one in the passage direct to the chimney and the other in the by-pass in which the boiler is placed.

Coke Screening.

The coke coming from the retort bench is taken in small wagons in the cage of a vertical hoist arranged alongside the screening house. The wagon is clamped to the cage, raised, and emptied into an upper hopper of reinforced concrete. The coke is thus protected from all unnecessary handling and breakage.

When this hopper contains a sufficient quantity of coke, the material is drawn over a roller screen on the Roisin-Richard system, which classifies it into five categories. These fall into the silos, the bases of which are provided with mouthpieces, permitting either the direct filling of carts or heaping in the yard by means of a portable conveyor, or, finally, of sacking on the quay.

Showroom.

Concurrently with this modernizing of the gas-works, the Directors have built a showroom, opened recently, to give publicity to gas and to increase sales. The whole of the ground floor of this building is occupied by a sales room, in which are exhibited appliances of the most recent design. The building also contains a gas kitchen in which periodical exhibitions and demonstrations are given.

M. Alavoine.

THE NEW PATENT : : : ACT : : :

By Bertram T. King, Reg. Patent Agent (G.B. and Canada), Foreign Member Institutes Australian and New Zealand Patent Attorneys

The Patents and Designs Act, 1932, which comes into force on Nov. 1, effects certain changes in the law relating to inventions and industrial designs. The alterations are numerous, and it is not possible to deal with them completely in the compass of a short article. Some are of greater importance than others, and it is proposed to consider those likely to be of interest to business men and manufacturers whose work brings them into contact with novel developments in commerce and industry.

Provisional Protection.

The period of provisional protection under the new Act is extended by three months, so that the Complete Specification may now be left at any time within twelve months from the date of the application. This period is the same as that allowed in which to file applications abroad under the International and Inter-Colonial Arrangements; so that if the Complete Specification is not left until the end of the period allowed, and if foreign patents are contemplated, then the foreign applications will have to be despatched before the Complete Specification is on the file in this country. Further, unless the Complete Specification following the Provisional Application is left well before the expiration of the twelve months, the search on novelty made by the Patent Office—the result of which very often influences the applicant's decision with regard to Foreign Patents—will not be available.

An applicant may now request the Comptroller to treat a Complete Specification filed with the application as though it were a provisional one, or may ask that an application for a patent be post-dated, any time before acceptance, for a period not exceeding six months. The latter is a risky procedure, but may sometimes be desirable.

Search on Novelty.

A very important change concerns the search made by Patent Office officials to determine to some degree whether an invention sought to be patented is novel. Formerly the official search was directed to the investigation of previous British patent specifications filed on applications for patents during the past fifty years. Under the new Act the search may be extended to foreign specifications and other documents. The widening of the search brings the English practice more into line with that prevailing in Germany and the United States of America, but the fact that a patent is granted is still no guarantee of its validity.

Acceptance of Complete Specification and Sealing of a Patent.

It is anticipated that greater work will be involved in carrying out the more extensive search directed by the new Act, and the time for obtaining acceptance of the Complete Specification has been extended to 18 months from the application date. The Government fees on filing a Complete Specification have also been increased.

The time in which a patent must be sealed has been extended from 18 months to 21 months, so that under the

new Act the maximum time within which the patent must be sealed, including extensions of time, which are obtainable (as under the principal Act), is 28 months.

Further, this period may be extended by such an amount as appears to the Comptroller to be necessary, if it is proved that hardship would arise in connection with a patent application outside the United Kingdom. This applies particularly in the case of an application for a patent in the United States of America filed after twelve months from the application date in this country, as the American Patent must issue—*i.e.*, be granted—before any patent for the same invention in any country.

Revocation and Infringement of a Patent.

Many new grounds upon which application may be made by petition to the Court for revocation of a patent have been added. Formerly, if in an action for infringement of a patent it was found that some claims of the specification were valid and that others were invalid, the Court was directed to grant relief in respect of the valid claims without regard to the invalid ones. By the new Act the patentee has to furnish proof that invalid claims were framed in good faith and with reasonable skill and knowledge, if he wishes the Court to grant relief in respect of valid claims without regard to invalid ones. If the patentee does not furnish such proof, the Court will not grant any relief by way of damages or costs, but may grant other relief such as an injunction in respect of any valid claim which is infringed. The above provisions make it more than ever necessary to exercise care and to obtain professional assistance in preparing a Complete Specification for Letters Patent.

Frivolous Applications.

During the past, patents have been granted for so-called perpetual motion machines and such like contrivances which obviously would not work. The new Act deals with this matter, and empowers the Comptroller to refuse to grant a patent upon what he regards as a frivolous application. This is a wise alteration, because unfortunately ill-informed inventors and purchasers have sometimes wasted money on patents of this kind.

Among other changes made, the following may be mentioned: Tightening-up of the law in cases of groundless threats of legal proceedings, provision for the granting of a patent to the assignee of the applicant, the hearing of appeals from the Comptroller's decision by an Appeal Tribunal, and amendments in the law dealing with British Applications which are based on applications filed in other countries.

In general, the new Act applies to applications filed before as well as after the passing of the Act.

It is not possible to deal more minutely in this article with the various charges introduced by the Patents and Designs Act, 1932, but should any reader desire further information on this subject, the writer will be pleased to answer any questions submitted to him at Wardrobe Chambers, London, E.C. 4.

WIND PRESSURE ON SPIRAL GASHOLDERS

An investigation into the results of experimental research on Wind Pressure and its influence on Gasholder Design

By S. M. Milbourne, A.M.I.Struct.E.

Since wind pressure and its subsequent effect form one of the principal features of gasholder design, it is scarcely necessary to emphasize the great importance of this subject to all who are interested in these structures. In order, therefore, to amplify the subject-matter of this paper as far as possible, a number of references have been given so that a more comprehensive study may be made if required.

Although a considerable amount of research work has been undertaken with regard to wind pressure, it is only comparatively recently that more definite conclusions have been reached respecting the behaviour of the wind on flat surfaces of buildings, bridges, and similar structures. Various writers have, in the past, suggested wind pressures of 15 to 56 lbs. per sq. ft. should be allowed on the normal surface for general buildings, and gasholders have in some instances been included among these structures, without discrimination. Experiments have been carried out from time to time on brick walls and actual buildings, and the conclusions reached have undoubtedly resulted in standardizing the allowable wind pressures for these structures[1]. In the case of gasholders, no exhaustive tests have been made on the actual structures and much of the information regarding the influence of the wind has been obtained on small scale models only. Consequently, there has been from time to time a great diversity of opinion regarding the maximum wind pressure to be allowed on these particular structures.

In Germany and many parts of the Continent it is common practice to base the design of gasholders on a wind pressure of 30 to 41 lbs. per sq. ft., while a snow load operating on one half of the crown is also taken into account. In this country wind pressures of 40 lbs., with an additional allowance for a snow load acting on one quarter of the crown, are often specified. According to Mr. A. D. Young[2], a guide-framed gasholder of 3 million c.ft. capacity erected in the year 1925 at the Old Hall Gas-Works of the Burnley Corporation, was designed to resist a normal wind load of 48 lbs. per sq. ft.; no snow load was taken into account in this case.

While the above represent examples of the highest values taken for wind pressure on gasholders in recent years, it is interesting to note that normal pressures of 15 to 25 lbs. per sq. ft. only have been suggested by some writers. In the absence of more definite information, it is impossible to say with certainty what value should be allowed for the normal wind pressure on a gasholder, but a rough estimation can be obtained by considering the past records of wind velocities.

Centre of Wind Pressure and Overturning Moment.

According to the Meteorological Department[3] of the Air Ministry, wind velocities of 90 to 100 miles per hour are rare in the British Isles, even at the most exposed geographical positions. Most of the records are, however, taken at heights of about 50 to 100 ft. above ground. Therefore, in order to decide the allowable normal wind pressure that may be adopted for gasholder design, it is necessary to investigate the probable increase of velocity with altitude.

It has proved a difficult matter to find a formula which will give the wind velocity at different altitudes with any degree of certainty in simple terms of the height above ground. Equations have been constructed, however, giving an approximate relationship between wind velocity and height above ground. Some of the early experiments on wind velocity at different altitudes appeared to indicate that the speed of the wind varied as the fourth root of the height, and Prof. E. D. Archibald[4] deduced the expression:

$$V = v\left(\frac{H}{h}\right)^{0.25} \quad \ldots\ldots\ldots\ldots \quad (1)$$

where v = the known velocity of wind in miles per hour at height h.
H = height at which wind velocity V obtains.

This formula led to the supposition that the pressure varied as the square root of the height. More recent experiments carried out on ships at sea for the Aeronautical Research Committee[5] showed that wind velocities at different altitudes are subject to considerable variation, but it has been suggested that, if a mean value of the results was taken, then $V \propto H^{0.137}$. The following formula, however, has now been adopted by the International Meteorological Committee:

$$V = v\,\frac{\{1 + 2{\cdot}81 \log (H_m + 4{\cdot}75)\}}{\{1 + 2{\cdot}81 \log (h_m + 4{\cdot}75)\}} \quad \ldots \quad (2)$$

where H_m = the height in metres at which the wind velocity V obtains.
v = the known velocity of wind at height h_m metres.

Dr. C. F. Marvin,[4] Chief of the U.S. Weather Bureau, suggests that Hellman's empirical formula (applicable to open country) should be used to determine the variation in velocity with altitude. This formula is similar in construction to that found by Archibald, and may be written as follows:

$$V = v\left(\frac{H}{h}\right)^{0.2} \quad \ldots\ldots\ldots\ldots \quad (3)$$

The writer has investigated formulæ (2) and (3), and finds that for altitudes up to 300 ft. these expressions give results which are practically identical. Since the largest spiral-guided holders in this country do not exceed 250 ft. in height, Hellman's formula will be used on account of its simplicity.

The normal wind pressure on flat surfaces varies as the square of the velocity, and has been ascertained by Sir Thomas E. Stanton[7] to conform to the law which may be approximately represented by

$$p = KV^2 \quad \ldots\ldots\ldots\ldots\ldots (4)$$

where p = the normal wind pressure in lbs. per sq. ft.,
V = velocity of wind in miles per hour,
K = a constant = 0·003.

The variation in pressure of wind with altitude may therefore be determined by substituting for the velocity V in equation (4) the value in terms of v, H, and h as given in equation (3). Then

$$p = K\left\{v\left(\frac{H}{h}\right)^{0.2}\right\}^2$$

or

$$p = Kv^2\left(\frac{H}{h}\right)^{0.4} \quad \ldots\ldots\ldots\ldots (5)$$

The distance $\bar{h}$ from the ground to the centre of pressure will then be given by the expression

$$\bar{h} = \frac{K\,v^2\,h^{-0.4}\int_{H_0}^{H_1} H^{0.4}\,.\,H\,.\,dH}{K\,v^2\,h^{-0.4}\int_{H_0}^{H_1} H^{0.4}\,.\,dH}$$

or

$$\bar{h} = \frac{\int_{H_0}^{H_1} H^{1.4}\,.\,dH}{\int_{H_0}^{H_1} H^{0.4}\,.\,dH} \quad \ldots\ldots\ldots\ldots (6)$$

where H_1 and H_0 = the upper and lower limits of the height of the structure. For the floating portion of the holder only, H_0 = the height of the steel tank above ground, and H_1 = the total height of the holder from ground level. If it is required to ascertain the position of centre of pressure on the whole structure, including the steel tank, then obviously $H_0 = 0$, and the resulting value of $\bar{h} = \frac{7H_1}{12}$.

In order to ascertain the total load of the wind on the structure it is necessary to determine the values of the constant $K\,v^2\,h^{-0.4}$. This may be obtained by assuming a maximum velocity at a given altitude. An investigation of the Annual Summary of the Monthly Weather Report, 1931, shows that it will be permissible to assume a maximum wind velocity of 90 miles per hour at a height of 50 ft. Substituting these values in $v^2\,h^{-0.4}$ the constant $Kv^2\,h^{-0.4} = 3{\cdot}08$.

The total force of the wind load P in lbs. on the gasholder is given by the expression

$$P = \frac{DZKv^2}{h^{0.4}}\int_{H_0}^{H_1} H^{0.4}\,.\,dH \quad \ldots\ldots (7)$$

where D = the diameter of the holder in feet,
Z = the shape or drag coefficient of the cylindrical structure.

Reducing equation (7) the following is obtained when $H_0 = 0$ and $Kv^2\,h^{-0.4} = 3{\cdot}08$.

$$P = 3{\cdot}63\ DZ\ \sqrt[5]{H_1^7} \quad \ldots\ldots\ldots (8)$$

The moment due to wind ($P\bar{h}$) in foot pounds will then be

$$P\bar{h} = 2{\cdot}1\ DZ\ \sqrt[5]{H_1^{12}} \quad \ldots\ldots\ldots (9)$$

Now the overturning moment generally assumed in spiral and guide framed gasholder design allows for the maximum pressure of the wind load operating on the full depth of the structure without variation, so that the centre of pressure is situated at a distance from the ground equal to $\frac{H_1}{2}$. This results in the well-known expression—

$$P_1\,\bar{h}_1 = \frac{p\,DZH_1^2}{2} \quad \ldots\ldots\ldots (10)$$

where $P_1\,\bar{h}_1$ = the overturning moment of the wind on the structure,
p = the maximum wind pressure allowed on the normal surface (35 lbs. per sq. ft.).

To compare the overturning moment of the wind as found in equation (9) with the general expression given in (10), it is most convenient to graph the two equations, and these are shown in fig. 1. It will be observed that if p = 35 lbs. per sq. ft. in equation (10), the overturning moment of the wind is about 25 p.ct. too high at H_1 = 100 ft. This appears to indicate that a reduction in the normal wind pressure from 35 lbs. to 26·3 lbs. per sq. ft. may be made for holders with a height not exceeding 100 ft., but it is not desirable to allow a lower normal pressure than 30 lbs. per sq. ft. for spiral-guided gasholders.

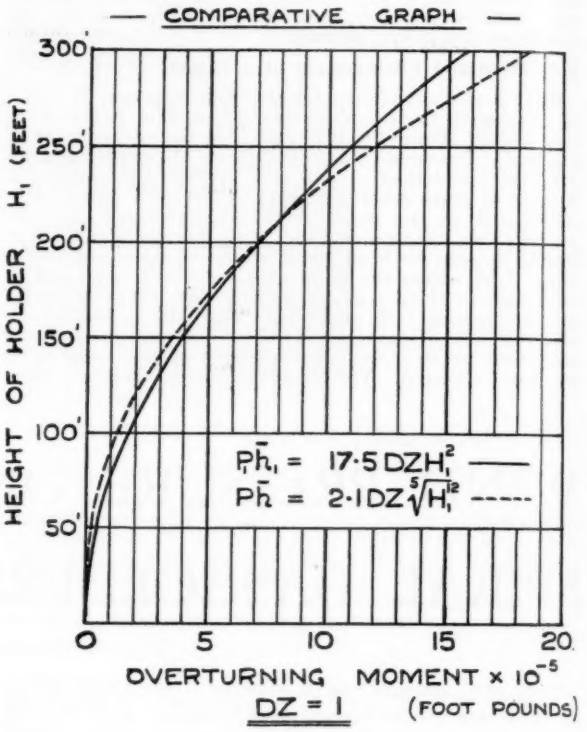


Fig. 1.

When H_1 = 200 ft. it will be seen that both equations are identical. At a height H_1 = 250 ft., the overturning moment due to wind is 9·0 p.ct. too low if calculated by equation (10), but this is compensated by the fact that there is a falling-off in wind pressure in the vicinity of the top curb due to the discontinuity of the structure at that point. From these results it appears that with water sealed holders having the usual proportions of diameter to height, the normal wind pressure of 35 lbs. per sq. ft. is a reasonable allowance for structures up to about 250 ft. high.

There is reason to believe that with very high winds the velocity-altitude gradient does not increase so rapidly as Hellman's formula would appear to indicate, and also that high velocities may obtain within a few feet of the ground. These conditions more nearly approach the usual constant velocity assumption as represented by equation (10).

Distribution of Wind Pressure on Cylindrical Surfaces.

The proper distribution of wind pressure round the circumference of a gasholder is not only required in determining the overturning moment of the wind on the floating holder, but it is necessary in order that the distortion forces on the structure may also be calculated. The variation in wind pressure round the surface of a cylinder placed with its axis at right-angles to the wind cannot be interpreted mathematically, owing to the fact that air is viscous. A mechanical representation of the action of wind on cylindrical surfaces, however, has been suggested by F. S. Cripps[8] in "Engineering," 1914.

The actual distribution of wind pressure round cylindrical objects has been ascertained experimentally on models generally of a few inches diameter in wind tunnels. Useful data have also been obtained from experiments on circular chimney shafts. The method adopted in measuring the pressure on circular models in wind tunnels may be briefly described as follows: A number of small diameter holes are drilled in the side of the cylinder in the same vertical plane. These holes are connected inside the model with a central vertical chamber, at the bottom of which is fixed a flexible pipe connecting to a pressure tube. A connection is also made from the pres-

sure tube to the wall of the wind tunnel in order to obtain the pressure potential on the cylinder in relation to the static pressure obtaining in the tunnel. The cylinder is arranged in the wind tunnel in such a manner that it may be rotated in any direction. The holes in the side of the cylinder are then stopped with wax or clay, except one in the horizontal plane of which it is desired to investigate the pressure distribution. After a record of the wind pressure has been obtained with the hole facing the direction of the wind, the cylinder is then rotated through a known angle and further records are taken. This procedure may be repeated until the model has been turned through an angle of 180° or 360°. It is usually considered sufficient for practical purposes if the pressure on the cylinder is recorded at angles of ten degrees. The effect of the walls of the wind channel is noticeable, and in order to obtain more accurate results of pressure distribution on long cylinders, it is preferable to make the experiments at points round the centre of the cylinder equidistant from the tunnel walls. When experimenting on models representing gasholders, the cylinders are usually mounted on the bottom of the wind channel or on a wide base board, so that the ground effect on the wind currents may be appropriated.

J. O. V. Irminger,[9] of Copenhagen, appears to have been the first to make a systematic study of wind pressure on gasholders, in the year 1894. His experiments were carried out on small wooden models having a ratio of height to diameter similar to the proportion of the actual structures. Experiments were also made on long cylinders having a length many times the diameter. But in the case of both the long and the short cylinders, it was found that the distribution of wind pressure on the windward side of the models was bounded by an angle of approximately 70° from the centre of the cylinder, while a suction operated over the remainder of the curved surface. The distribution as found by Irminger for long cylinders is shown in fig. 2. The radial force vectors represent the coefficients of pressure and suction intensity, as a proportion of the normal wind pressure, and these are drawn to scale at a number of points round the cylindrical surface. In this instance the wind velocity of 54 ft. per second was used.

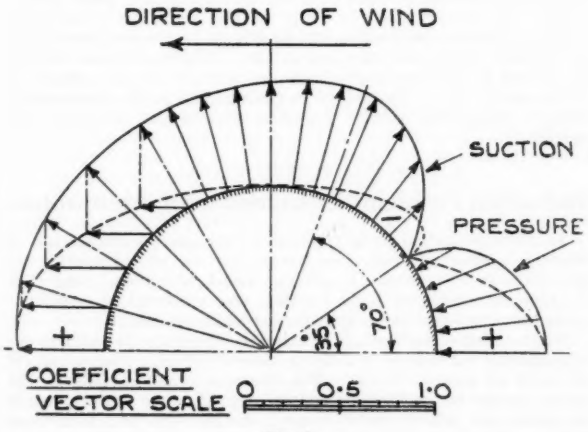


Fig. 2.

These results were eventually confirmed by A. Fage[10] at the National Physical Laboratory. In this case the cylinder consisted of brass tubing 2 in. in diameter, and extended the full width of the wind tunnel, while the wind velocity was 30 ft. per second.

Prof. F. K. Th. v. Iterson, of Delft, also investigated the distribution of wind pressure round cylinders, and results similar to those found by Irminger were obtained. Further experiments were carried out by A. G. v. Baumhauer[11] at the Aerodynamic Station, Gottingen, about 1920, on a model gasholder 80 mm. diameter by 71 mm. high, with a wind tunnel velocity of 40 ft. per second. Records of the wind pressure were taken at 12 planes of different height from the base of the model, and these indicated that at a height of 0·62 H_1 a gradual diminution of the pressure occurs which eventually becomes rapid as a point 0·84 H_1 is approached, while the suction on the windward side of the model was found to increase. Fig. 3 illustrates the distribution of the wind pressure and suction on the model. It is interesting to note that after summing the pressure and suction vectors in the direction of the wind at all the vertical planes, it was found that the centre of pressure of the wind load occurred at a point distant 0·44 H_1 from the ground plate of the model.

The experiments of Irminger, Iterson, Fage, and Baumhauer were carried out on small models at low wind velocities, but, from a consideration of the various physical quantities involved when wind flows past an object in its stream, it may be shown that the form of flow must be a function of the Reynolds number, usually expressed as a ratio $\frac{VD}{\nu}$, where V = the velocity, D = the diameter (in the case of cylinders) and ν = the kinematic viscosity. Prof. G. I. Taylor[12] found that when a cylinder 6 in. in diameter was subjected to a wind velocity of 40 ft. per second the distribution of pressure and suction was similar to that found by Irminger, but at a wind speed of 55 ft. per second the distribution of suction in the regions of 30° to 125° and 235° to 330° on the surface of the cylinder was very greatly increased. M. Eiffel observed

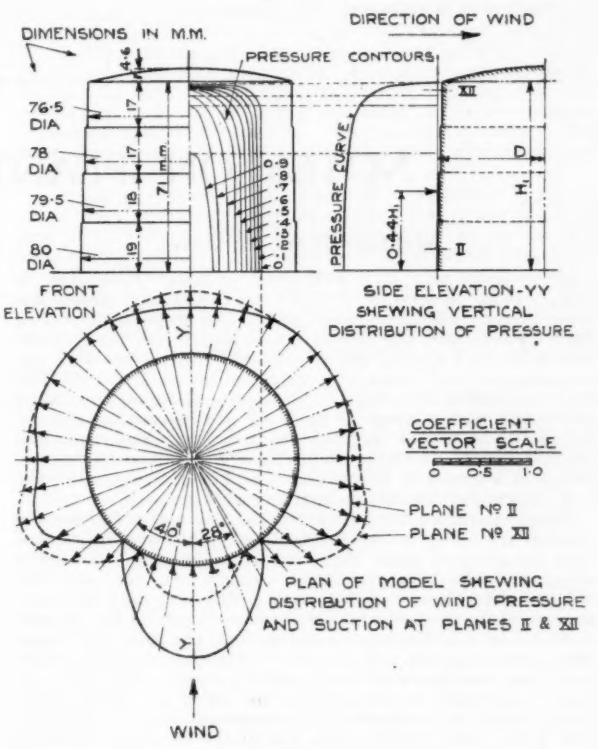


Fig. 3.

a similar change in the suction on experimenting with a sphere 6½ in. in diameter when the wind speed reached 42 ft. per second. If the value of ν remains constant, it is a simple matter to compare the diameter-velocities VD. In the case of the changes in pressure distribution cited above it will be seen that the critical value was reached in each case when VD = 240 to 270 ft. inches per second. The critical value VD = 240 to 340 ft. inches per second has since been confirmed for larger diameter cylinders. These experiments, however, were confined to long cylinders, so that the distribution of wind pressure and suction cannot be directly applied to the case of a gasholder having a ratio of diameter to height of 1 to 0·63 or 1 to 1.

H. L. Dryden and G. C. Hill,[13] of the U.S. National Bureau of Standards, have investigated the distribution of wind pressure on cylinders of 8 in. and 12½ in. diameter by 5 ft. long secured at one end to the floor of the wind tunnel, while the upper end was free to the unrestricted action of the wind. The wind velocities used were 40, 60, 80, and 97 ft. per second. The reduction in pressure round the surfaces at distances of about 0·5D from the top or free end of the cylinders tends to confirm Baumhauer's results respecting the vertical distribution of wind pressure on a model gasholder.

If the results of experiments concerning the critical values of wind velocities are applied to large cylinders such as gasholders, it follows that the critical values of the Reynolds number would be reached at very low wind velocities. The value of VD for a gasholder of, say, 170 ft. diameter in a 48 miles per hour wind is 144,000 ft. inches per second. At the highest values of VD (1840 ft. inches per second) in wind tunnel experiments on cylinders[14] it was found that the distribution of the pressure-suction curve was still changing. Until further results are obtained at high Reynolds values, it is impossible to accurately define the form of pressure distribution curve

for large cylindrical structures such as gasholders; but it is evident that the distribution of pressure and suction will be similar to that indicated in fig. 2.

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[4] "The Variation of Wind Velocity with Height," by E. H. Chapman, R.E. Professional Notes No. 6, Meteorological Office, London.

[5] "Note on Change of Wind with Height," by L. W. Bryant, A R.C.Sc. Aeronautical Research Committee, R. & M. No 1407, 1931.

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[7] "Wind Pressure," by T. E. Stanton, D.Sc. Proceedings of the Institution of Civil Engineers, Paper No. 3695/08. Also "Wind Pressures and Stresses Caused by Wind on Bridges," by D. H. Remfry, Assoc.M.Inst.C.E. Proceedings of the Institution of Civil Engineers, Paper No. 4363/23.

[8] "Distribution of Pressure Round Cylindrical Rods and Bodies when Exposed to Air Currents." "Engineering," Sept. 4, 1914.

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[10] "Determination of Pressure Distribution Round a Cylinder." Aeronautical Research Committee, R. & M. No. 106, 1913.

[11] "Drukmeting op het model van een gashouder in een kunstmatigen windstroom." "De Ingenieur" No. 18, 1920.

[12] "Pressure Distribution Round a Cylinder." Aeronautical Research Committee, R. & M. No. 191, 1916.

[13] "Wind Pressure on Cylinders and Chimneys." U.S. National Bureau of Standards, Journal of Research, Vol. V., 1930.

[14] "Drag of Circular Cylinders and Spheres," by A. Fage, A.R.C.Sc. Aeronautical Research Committee, R. & M. No. 1370, 1930.

(To be concluded.)

NOTES ON PLANT AND PROCESSES

Measurement of Gas.

In a brochure, just published, Messrs. Parkinson & Cowan (Gas Meters), Ltd., refer to the change which has come about since the passing of the Gas Regulation Act in 1920. Previously the size of a gas meter had been determined by its capacity per revolution, and its pressure absorption was kept down by a strict limitation of speed. The Gas Regulation Act contained an optional clause specifying five-tenths water gauge as the limit of differential pressure for small consumers' meters, and this, after some time had elapsed for the Industry to realize its significance, has resulted in a tendency to disregard, and even to decrease, the bulk of gas per revolution, and to increase speed.

Thus, continues the brochure, the gas meter follows the general tendency in the design of all plant and apparatus both for gas and other branches of engineering. Economy of space, reduction of capital expenditure, and possibly some slight influence of American practice in anticipating a shorter life; these are considerations making for the change.

There is a widespread opinion that the time has come when gas suppliers and meter makers should again confer over the standardization of meter ratings, and also consider reasonable limitations in the speed at which a dry meter may be worked. In the meantime, the demand which has been created, has led to the re-design of small meters under the title of "high capacity." For example, the interior of a "2-light" case, previously rated at 12 c.ft. per hour at two-tenths absorption, has been reconstructed. Now it is rated at 30 c.ft. per hour, which quantity it will pass at a differential pressure of less than two-tenths, but it is possible to make a meter of this size that will pass a very large volume at five-tenths pressure absorption.

Design of High Capacity Meter.

The making up of a "high capacity" gas meter presents no great difficulty. Most of the pressure absorption lies in the gas passages and, to reduce resistance, these have to be enlarged. The valve-plate must be re-designed to admit of the larger gasways, and in doing this it will be found that the ordinary straight reciprocating slide-valve is still the equal of any valve yet produced. Skill and geometrical accuracy are required in the design of valves and links so as to minimize oscillation in the working of the meter.

So far as the mechanism is concerned, there is plenty of gas power on the diaphragm to drive the index at speed, but wear and tear of the metallic parts must be considered. The leather itself, which bounds the measuring chambers, will not suffer deterioration purely through excess of movement, only through contact with metal, or by chemical influences. Previously the endeavour has been to obtain the greatest capacity per revolution, but it is now found that a moderated movement of the diaphragm, together with a reasonable increase of speed, will result in more consistent accuracy of registration.

In the pursuit of speed there is always a certain amount of risk, and the meter maker should not be tempted to "cut things too fine." There are a hundred and one points in the construction of a gas meter where care in design and supervision in manufacture make all the difference to the ultimate performance. A meter should not be rated to a maximum capacity beyond that at which it can measure with consistent accuracy, when tested throughout its whole range. There are meters which are accurate at the expense of oscillation, and sometimes oscillation is overcome at the expense of accuracy.

Weight is not necessarily a criterion of strength or quality in a gas meter; not even weight of solder. The soundness and durability of stuffing boxes, the right selection of metal alloys for slide valves, and experience in making up the leather diaphragms, all contribute to the art of the meter manufacturer. Incidentally, the aim should be, as far as possible, to produce a meter that is noiseless.

It is not always realized that the same changes in design that make for greater speed at a given pressure absorption, will, if the original speed be maintained, reduce the pressure loss. In any type of meter, and for several reasons, reduction of pressure absorption must enhance the accuracy of registration, while a meter with reduced pressure loss has some reserve in readiness for an emergency peak load.

Having remarked that most of the pressure absorption within a meter lies in the gas passages, attention must also be drawn to the loss at connections. Much pressure can be absorbed in the passage of gas at speed through piping of inadequate size. Therefore in testing the performance of a meter, pressures should be taken strictly at its inlet and outlet.

Industrial Problems Lightened with Aluminium.

In such widely differing problems as the co-ordination of electric power supply, the protection of metal work, the production of record-breaking road vehicles, and the hygienic capping of milk bottles, the material of construction has the same principal factor—aluminium.

For long distance overhead power transmission, aluminium is re-inforced by a core of steel. For paint, it is used in powder form. For car and coach building, the comparatively unstressed parts are of pure metal, while components which bear heavy strains are of aluminium alloy. For bottle caps and containers, pure metal is used, which for decorative effect may be frosted, tinted, or enamelled.

The versatility of the metal, its uses in multifarious forms, with or without the assistance of other metals or special treatments, finds illustration in the pages of an attractive booklet recently published by the British Aluminium Company, Ltd., of Adelaide House, King William Street, E.C. 4.

An Improved Meter Valve Arrangement.

After a considerable amount of research and experiment, Messrs. George Wilson Gas Meters, Ltd., of Coventry, London, and Manchester, are marketing for what they suggest is the first time in the history of gas engineering, a gas meter so constructed that when the diaphragm reaches the end of its stroke and changes its direction, only the exhaust port of the valve is closed, thus leaving the diaphragm free to change its direction unrestricted.

The firm state in a leaflet just published that since, in this meter, there is no greater loss of pressure than in a 10 ft. line of pipe, equal in diameter to that of the inlet and outlet of the meter, they have named it the "Straight Line Meter."

The danger of passing unregistered gas has always been

a very real problem to the gas engineer, but with the "Straight Line Meter," since the exhaust port is sealed from unmeasured gas until the diaphragm commences its fresh circuit, they state, there is less danger of passing unmeasured gas than with the valve used at present. The action of deposits on the seatings, often resulting in "unregistered gas," is also largely eliminated, as the valves are of the self-cleaning type.

Another advantage arising from the action of this valve is an almost perfect freedom from oscillation at badged capacity. When it is considered that oscillation always means a definite strain on the diaphragms of the meter, and that by this valve design about 1200 shocks per hour are eliminated (when the meter is working at badged capacity) this advantage will be readily understood. The total oscillation and loss of pressure at badged capacity is hardly observable.

Hitherto, it has been a general practice to reduce loss of pressure in a meter by employing the open top construction. The "Straight Line Meter" is of the enclosed valve chamber variety, giving the additional safeguard connected with this construction, also preventing delicate parts from working in gas, and at the same time showing the lowest loss of pressure yet recorded.

Gas Purifying Material.

The Manchester Oxide Company, Ltd., of Miles Platting, Manchester, have published an attractive little brochure giving information referring to the use of their gas purifying material.

The rotation system, which is now almost universal practice in the working of gas purifiers, has necessitated closer control of conditions and the choice of the oxide best suited for the purpose, state the firm, and in order that the best results may be obtained, and the oxide fouled to 48-50 per cent. sulphur in one or two exposures, instead of the many exposures as under the old non-rotation system, it is necessary that the material should possess the qualities of activity and porosity.

The old calculation of half a square foot superficial area of oxide per 1000 c.ft. of gas per day does not now alone suffice, as it is recognized that the depth of oxide in the boxes and, therefore, the time of contact is the controlling factor. The oxide boxes should be of such capacity that 1 c.ft. of oxide in the first taker passes about 25 c.ft. of gas per hour at maximum make. If this figure be exceeded the purification efficiency is adversely affected.

It is advantageous, therefore, that the greatest possible depth of oxide be put into the boxes and no available space wasted, but it is essential that the increased depth does not cause trouble due to back pressure, and it is with this point in view that the firm have produced their present standard of fresh oxide. The moisture content in their material is the optimum amount which they have found by experience to provide space for the accumulation of elemental sulphur and also provide the moisture which is lost by the heat of the chemical reaction in the boxes. Alkali is evenly distributed throughout the material during its preparation and may be varied to meet special requirements. Such an oxide is particularly suitable for the purification of coal gas or coke oven gas from which all but small traces of ammonia have been removed by direct acid recovery.

Aerograph and DeVilbiss Spray Painting and Finishing Equipment.

In every industry where paints, enamels, varnishes, lacquers, and other liquid or semi-liquid decorative or protective finishes are applied both Aerograph and DeVilbiss spray-painting and finishing equipment have gained a reputation for fine finishes, speed of application, economy in material and maintenance cost combined with easy and efficient operation.

In a catalogue recently issued by the Aerograph Company, Ltd., of Lower Sydenham, S.E. 26, are shown for the first time the most popular items of these two famous makes consolidated into a complete line of equipment.

For nearly 40 years the firm have been handling finishing problems of all kinds, and the valuable data gained during this extensive experience is available to-day to assist in solving particular problems of painting, polishing, bronzing, lacquering, enamelling, and every form of decorative or protective process. No matter whether large surfaces or articles of metal, wood, composition, leather, or fabric ranging from buttons to motor cars have to be painted, there is equipment designed by the firm which will provide good finishes at small cost.

About "Vitreosil."

A booklet recently published by the Thermal Syndicate, Ltd., of Wallsend-on-Tyne, deals with the properties and commercial and scientific applications of "Vitreosil" pure fused quartz.

"Vitreosil" consists of pure silica fused by the original and patented electric process of the Thermal Syndicate, Ltd., into a thoroughly homogeneous and uniform product containing over 99·8 p.ct. SiO_2. It was first placed on the market in 1906, and is vitreous silica—that is, it is non-crystalline. It is prepared in three varieties—opaque, translucent, and transparent. The booklet goes on to deal with its chemical, thermal, mechanical, electrical, and optical properties.

Among the many applications of "Vitreosil" may be cited the following: Apparatus and plants for chemical and allied industries; articles for the lighting and heating industries; springs for the accurate weighing of very small bodies; fibres for torsion balances and galvanometer; optical apparatus; monochromatic light and ultra violet radiation apparatus; radio-therapeutic apparatus; artistic and decorative articles. A number of these applications are described in detail and illustrated in the pages that follow.

In concluding the brochure it is remarked that the scope of the application of "Vitreosil" is continually extending, and new articles for laboratory and experimental purposes are being constantly introduced, to which it is impossible to refer in this publication; but as the firm now undertake to manufacture apparatus in "Vitreosil" to almost any design, inquiries in this connection will always receive prompt and careful attention.

One of the latest products is the flame-proof lustre cooking pan, made in three sizes, concerning which a leaflet has just been issued. This cooking ware is of interest to the Gas Industry as it is really heat-proof like the heat-proof gas globes, and may be put straight into a hot oven, direct on to a gas ring, or beneath the grill without harm.

REVIEWS

"SANDS, CLAYS, AND MINERALS."*

The second number of "Sands, Clays, and Minerals," a quarterly magazine for all interested in economic minerals, has just been published by Algernon Lewin Curtis, of Chatteris. We read from the Editorial Notes that commendations on the first number have reached the publishers from all parts of the Empire, and that subscriptions continue to come in from scientific institutions, research departments, and industrial concerns.

There is no "padding" in "Sands, Clays, and Minerals," and technical men will find every page of interest, both immediate and prospective. The second issue consists of sixty pages of interesting and instructive articles, covering a wide range of subjects, while neither pains nor expense have been spared in producing the coloured plates which are one of the features of this magazine. It is the policy of the publication to give wider publicity to the development of minerals within the British Empire and their application to British industry.

Among the varied subjects dealt with in the present number are: Osmiridium in Tasmania; Setting Refractory Bricks in Marine Boiler Furnaces; Australian Opals; A Simple Way to Analyze Clay; Ontario as a Metal Producer; Fullers Earth; the National Sand Association; Rock Sections; Minerals and the British Empire; Some Little Known Uses of Clay; Nimol, a new alloy; and the Modern Roadstone Quarry. In conclusion, a coloured supplement plate illustrates the various trade marks of British firebricks.

* "Sands, Clays, and Minerals," published quarterly by Algernon Lewin Curtis, Chatteris, England. Subscription, 5s. per annum; Foreign, 5s. 6d. per annum.

THE "JOURNAL" TECHNICAL RECORD

Which contains Reports of Meetings of Gas and Allied Associations

North of England Gas Managers' Association

AUTUMN MEETING

The members of the North of England Gas Managers' Association held their autumn meeting in the Laboratory Building of the Blackhall Colliery on Friday, Oct. 7, when a large attendance assembled under the Presidency of Mr. A. C. Hovey, of London.

It was the first time in the history of the Association that a meeting had been held at a colliery. At the invitation of the Chairman and Directors of Horden Collieries, Ltd., the visitors inspected the colliery plant and descended into the Horden Pit.

Horden Colliery and Blackhall Colliery are about two miles apart, and are both owned by Horden Collieries, Ltd. The Association meeting was held at Blackhall Colliery, prior to the visit to Horden. Also by kindness of the Chairman and Directors, the visitors were entertained at luncheon at the Blackhall Hotel, and at tea at Horden.

Losses by Death.

The President, at the outset of the meeting, referred to the death of Mr. H. Wilkinson, Secretary of the Harrogate Gas Company, who was President of the Association in 1907. He was a member of the Association for 28 years.

The President also recorded the death of Mr. Thomas Young, late Chairman of the Tynemouth Gas Company, which had been taken over by the Newcastle and Gateshead Company. Mr. Young, said the President, had died a few days ago. He was prominently associated with the Gas Industry in the North, and had done good work in connection with the North of England Gas Managers' Association.

New Members.

The President welcomed to the Association meeting two new members—Messrs. Morris H. Millett, Annfield Plain; David Yule, South Shields Gas Company.

He welcomed also the following Associate Members: Messrs. John G. Aitken, Carlisle; Arthur F. Kelley, Newcastle and Gateshead Gas Company; Ralph Williamson, Sunderland Gas Company.

The President announced that Mr. W. O. Kirkwood, of Sunderland, had obtained a First-Class Diploma in Gas Engineering of the Institution of Gas Engineers.

The President presented Higher Grade Certificates to the following external students: Messrs. J. F. Lord, Darlington; A. E. Peel, Stockton-on-Tees; A. H. Nicholson, Stockton-on-Tees; T. R. Wicks, Middlesbrough.

The President announced that the following internal students had gained Certificates at Rutherford College, Newcastle: Messrs. R. P. Davison, South Shields; A. F. Kelley, Gosforth; D. B. Laws, Sunderland; T. W. Lawson, Seaham Harbour; A. J. Millican, Sunderland; W. H. B. Porter, South Shields; R. Williamson, Sunderland.

Members of the Association of long standing, said the President, would remember Mr. H. Tobey, of Malton, who had been a member of the Association since 1877. Mr. Tobey had recently celebrated his diamond wedding anniversary, and the President suggested that the members of the Association should send to Mr. Tobey and his wife their congratulations.

The suggestion of the President was agreed to with acclamation.

Presidential Address.

Mr. Hovey then delivered the Presidential Address, the first instalment of which appears on pages 157-161 of this issue of the "Journal."

Vote of Thanks.

Mr. Thomas Hardie moved a vote of thanks to Mr. Hovey for his Presidential Address. Mr. Hovey had covered an astonishingly wide field of subjects, and the Address was one of outstanding merit. He had told them that 35 years ago he became a member of the Association. They were all pleased to see him, after his long association with them, and after he had done so much strenuous work in the Gas Industry, standing before them as their President with all the appearances of a young man. Mr. Hardie well remembered with what interest the members of the Association listened to the paper to which Mr. Hovey had referred, on the detailed construction and working results of the then new plant at Tynemouth. That was indeed a masterpiece. It showed Mr. Hovey's wonderful power of concentration and his great love of detail, together with his determination to win success, and they found in him that day those same qualifications further accentuated. His long and varied and active participation in the Gas Industry made him well qualified to address the members of the Association, and revive, as he had done, the development and alterations that had taken place in the Industry. His Address was of interest to both old and young members of the Association. It reminded those of his own generation of so much they had forgotten, such as the work at Sunderland in the early stages of waste-heat boilers, the work at Tynemouth, and so on. Those who were younger were fortunate in having in the Address a very complete history of the Industry, and in having had their attention drawn to many things which still required their close attention.

Mr. Hovey had shown in his Address the enormous progress that had been made in the Industry, but he had not left the impression that finality had been reached. On the contrary, he had indicated that there was room for further improvement and progress. In listening to the Address, continued Mr. Hardie, he was most impressed by the reference made by Mr. Hovey to the large amount of organization in the Industry. It was because of that organization that the Industry was making progress from day to day. It had been inspiring to listen to the Address, and he had the greatest pleasure in moving that the thanks of the Association be accorded to Mr. Hovey for the great trouble he had put himself to in the preparation of it, and for having brought so much of importance and value to the attention of the members of the Association.

Mr. Herbert Lees, Hexham, seconded. He recalled that it was rather more than forty years since he first met Mr. Hovey, but at that time Mr. Hovey was not in the Gas Industry. It was fortunate for the Industry, and, they hoped, for Mr. Hovey too, that he had found his way into the Industry, for he had been a great asset to it. His Address was a history of the Industry, summarized, and worthy of being kept for record and for perusal by those, in the future, who were interested in the history of the Industry.

The vote of thanks was accorded with acclamation.

The President, responding, said he was exceedingly obliged for the kind manner in which his efforts had been received by the Association. He had no regret at having come into the Gas Industry; he had found it exceedingly full of interest during the 35 years or more that he had been associated with it. "I can recommend it to anyone who is prepared to work hard and to have enthusiasm for his studies, and to work through many years to attain high position," he added. High positions were not numerous in the Industry. He had told them how many members there were in the Institution of Gas Engineers—less than 1500—and all of those were not men who were receiving very high remuneration. He had referred to this matter in his Address, and he hoped it would reach the heart as well as the eye of some of those who were responsible for the control of that particular department in the Industry. He believed that in the life-time of those in attendance at that day's meeting there would be seen further improvements, and more prosperous times in the Gas Industry, but that could be accomplished only by those who were in the Industry putting their best efforts into it, and encouraging their friends to do the same.

Presentation to Mr. Bagshaw.

The President, on behalf of the members of the Association, presented a voucher for an armchair to Mr. A. H. Bagshaw, of Sunderland, who has retired from the office of Hon. Secretary of the Auxiliary Section of the Association.

Mr. Bagshaw, he said, was the principal organizer of the Section, when it was formed in May, 1918, to encourage the younger men.

Mr. Hovey suggested that, although the papers of the

Auxiliary Section should be published in the Press, their discussions should not be published. This would encourage all to speak, and to speak from the heart as well as from the head. The members not only of the Auxiliary Section, but of the Association generally, recognized that Mr. Bagshaw had been of great service in the useful work he had performed in helping the young men, and he had given a great deal of time to his office. Twenty-eight half-yearly meetings meant much work of preparation, and the general success of the Section had largely depended upon the competent and energetic efforts of Mr. Bagshaw.

Mr. C. S. READ (Sunderland), Chairman of the Auxiliary Section, supported the observations made by the President, and said the members of the Auxiliary Section were exceedingly grateful to Mr. Bagshaw for the services he had given so freely to the Association.

Mr. BAGSHAW, expressing thanks for the presentation, said he was particularly delighted at the presentation having been made by Mr. Hovey, the President of the Association, because, outside Sunderland, Mr. Hovey was the first friend he made in the Gas Industry. He was glad to say that he had been able to retain Mr. Hovey's friendship ever since, a matter of thirty years; and he hoped to be able to retain it for another thirty years. He wished to thank Mr. T. P. Ridley, of the Newcastle and Gateshead Gas Company, for his courtesy in having allowed the Auxiliary Section to meet in his offices, from time to time; and he also desired to acknowledge the kindness he had received from Mr. Drury, his Chief at Sunderland.

On the conclusion of the meeting, the visitors were conducted through the laboratories at Blackhall Colliery, under the direction of the Colliery Manager, Mr. F. Chicken; and they were then entertained at luncheon.

VISIT TO HORDEN COLLIERY.

Luncheon over, they proceeded to Horden Colliery, where they were able to inspect the dry and wet coal cleaning plant, the powdered fuel plant, and the boilers and baths, at the pit head; and also to descend the pit to inspect the workings and the latest forms of coal cutters, conveyors, and the like.

The majority of the visitors went right up to the coal face, about three miles under the sea bed, the ride in being taken on the chair-railway provided in this modern electrically equipped colliery.

The visitors were told that for many years the London Gas Companies had been regularly taking large quantities of Horden gas coal, which also found a ready market in Berlin, Paris, and other Continental cities. The Company's four collieries—Horden, Blackhall, Shotton, and Castle Eden—were designed to win an area of about 28 square miles of coal in the South-East of Durham County, and the important industrial and shipping districts of the Tyne, Wear, and Tees were all within a radius of 25 miles, the nearest port, Hartlepool, being within ten miles of the collieries. The collieries were capable of an output of 3 million tons of coal per annum, drawn from the Main, Low Main, and Hutton Seams, the product being specially prepared for gas and coke making, and steam raising.

To meet the demand for a uniform quality of coal with a low ash content, the Company has for many years taken advantage of the latest cleaning devices. All coal over 3 in. is hand-cleaned, and coal below 3 in. is passed through either the dry or wet mechanical cleaners. By an arrangement with the Electric Power Company, the surplus gas from 120 coke ovens at Horden is utilized for generating current for the electrical equipment of the collieries, and all four Collieries are linked up with one another and with the Power Company's system of current supply. Surplus gas from coke ovens at Shotton Colliery is used for firing boilers.

From the laboratories, the following analysis of Horden gas coal was provided:

Volatiles	32·84 per cent.
Ash	7·65 ,,
Sulphur	2·08 ,,
Moisture	1·54 ,,
Calories per gramme	7,880
B.Th U. per lb.	14,180
Fusion point of ash	1,250° C.

Mr. F. P. TARRATT (Newcastle) gave expression to the gratitude of the members of the Association to the Chairman and Directors of the Horden Collieries for their invitation to hold the meeting at their collieries, for the facilities provided for descending the Horden Pit, and for the entertainment generously provided at the luncheon and tea. He coupled with this vote of thanks the name of Mr. J. P. Hall, Agent to the Horden Collieries, who had made himself responsible for the necessary arrangements for the entertainment of the visitors.

Mr. HALL acknowledged this expression of thanks, and apologized for the unavoidable absence of the Chairman and Managing Director of the Horden Collieries Company, Ltd., Mr. W. F. Whitwell, who, he said, had been keenly interested in the visit of the North of England Gas Managers' Association to Horden.

The PRESIDENT introduced to the gathering Alderman Fred J. West, C.B.E., an ex-Lord Mayor of Manchester, by whose visit the Association was greatly honoured, he said.

Alderman WEST thanked the Association for the welcome accorded him, and said he felt sure that the gathering at Horden was an opportune and important one from the point of view of the Association and the Gas Industry. It had brought the gas managers into closer contact with those who had to produce the coal, and that, in his opinion, could not fail to be beneficial to the Gas Industry and the coal industry. He thought there were occasions, such as at that meeting, where they could collaborate with one another, with mutual advantage.

Ceramic Society

Refractory Materials Section

The 26th Meeting of the Refractory Materials Section of the Ceramic Society was held in London at the rooms of the Chemical Society, Burlington House, on Sept. 20 and 21, the Chairman being Col. Alan Stein, M.C., President of the Society. The programme included the following items.

INFLUENCE OF CYANOGEN ON THE REDUCTION OF CARBON MONOXIDE IN CONTACT WITH REFRACTORY MATERIALS.

By H. W. HIBBOTT, B.Sc., and W. J. REES, M.Sc.

This topic, while specially interesting in connection with blast furnace practice, has an important bearing on operations such as gas manufacture, in which carbon deposition is a more or less marked feature.

Reference is made to a paper by Hubbard and Rees in the Transactions of the Ceramic Society (vol. 28, p. 27, 1929), a condensed report of which appeared in the "JOURNAL" at the time. Recent research with the aid of X-ray analysis has revived the "carbide" theory by revealing the fact that the reducing action of finely divided iron on carbon monoxide at 400° C. resulted in formation of the iron carbide known as cementite.

Cyanogen is a colourless combustible gas formed by the direct combination of carbon and nitrogen at high temperatures. Incomplete combustion of cyanogen has been found to give a mixture of carbon monoxide and carbon dioxide. On passing mixtures of cyanogen and air over heated catalysts (the oxides of iron, nickel, and copper were used) the products up to 800° C. were carbon monoxide and nitric oxide, but beyond that temperature the products were carbon monoxide and nitrogen. When iron oxide was used as catalyst, considerable deposition of carbon occurred with mixtures rich in cyanogen.

The authors passed gases over heated fragments of firebrick, and examined the results, the numerical and other data being presented in a series of tables and graphs. The results show clearly that cyanogen has a marked effect on the reduction of carbon monoxide passing over refractory surfaces. The reduction was increased when the carbon monoxide contained 0·2 p.ct. of cyanogen, and increased more with 0·5 p.ct. of cyanogen. With 1·5 p.ct. of cyanogen the effect is slightly less than with 0·5 p.ct., though much greater than for carbon monoxide alone. The temperature range of the reaction for the proportions of cyanogen mentioned was the same as for carbon monoxide alone —namely, 370°-500° C. With 4·5 p.ct. cyanogen there is very little reaction in this range of temperature, the main reaction starting at 540° C., and the amount of reduction being much less than for carbon monoxide alone. With higher proportions of cyanogen the reaction is practically negligible.

Much more research work is needed for the complete elucidation of the chemical reactions, but there are indications that cyanogen undergoes oxidation to some extent in every case, and it would seem that the cyanogen is oxidized by the ferric oxide (not by carbon monoxide).

Reduction of carbon monoxide is associated with disinte-

gration of the firebrick, and the extent of such disintegration corresponds roughly with the amount of carbon monoxide reduced.

Factors Affecting Furnace Practice.

By R. J. Sarjant, M.Sc.

This deals mainly with recent developments in connection with heat-resisting metals, which are finding increasing application in various industries. These metals fall into three main groups:

Class I.—Alloy steels containing various proportions of chromium, with smaller proportions of nickel and molybdenum. They are primarily adapted for superheated steam plant, their special properties being greater resistance to "creep" at the intermediate temperatures of high-steam superheat, and absence of any embrittlement occurring with lapse of time under service conditions, as, for example, in bolts and superheater tubes.

Class II.—Alloy steels with 18 to 25 p.ct. of chromium, 7 to 12 p.ct. of nickel, and some silicon and tungsten. For general furnace uses, up to 950° C., some of the most useful alloys belong to this class.

Class III.—High chromium irons with 0·5 to 2 p.ct. of carbon and 25 to 30 p.ct. of chromium, or high-nickel-chromium steels with 15 to 30 p.ct. of chromium and 12 to 80 p.ct. of nickel. The alloys of this third class are better adapted to withstand repeated heatings.

Strength at high temperatures is a dominant property of all these heat-resisting alloys. Under an overload at high temperatures metals undergo continuous deformation, usually termed creep, which arises from loss of elasticity and assumption of a plastic condition. With sufficient overload, breakage may ensue. With decreasing load a point is reached at which the creep is very small and the specimen remains sound.

The mechanical properties at ordinary and high temperatures, and the creep stress values, of a number of alloys whose chemical compositions are given are shown in tabular form.

Resistance to scaling of various alloys is shown by means of graphs. Chromium is the most important ingredient to promote resistance to scaling, but silicon is also favourable. Nickel and tungsten are neutral in this respect, but help to improve certain other properties.

These alloys offer the great advantage that they can be produced as castings, forgings, rolled bar and sections, sheet, wire, and drawn tubes. Castings and forgings are readily machinable, though slower than ordinary steels. They weld readily to themselves and to other steels.

Sidelights on Refractories in Open-Hearth Practice.

By R. Percival Smith.

This, as the title implies, has special reference to the open-hearth steel furnace refractories. It was illustrated by means of lantern slides. The considerations which apply to the use of refractories in open-hearth furnaces apply also to refractories in other industries to a very large extent.

Stress is laid on the necessity of using well-dried bricks and of ascertaining the proportionate cost of refractories for each part of the furnace, in order to see where it may be possible to effect economies.

Particulars are given concerning tests made with ladles, chequers, air ends, ports, gas and air slopes, open hearth walls, sloping back walls, open hearth crown, maintenance of roof costs, and mould shop refractories, many of which pointed the way to important improvements.

The Evaluation of Cellulose Sulphite Lye.

By A. Edwards and P. F. F. Clephane.

This is a communication from the Gas Light and Coke Company, Beckton.

Cellulose sulphite lye being used in the preparation of silica cement and silica bricks and shapes, methods of evaluation and analysis became necessary. Methods devised by the authors, and the apparatus used, are described.

The Drying of Magnesite Bricks—Volume Changes Accompanying Hydration.

By Dr. J. H. Chesters and Dr. W. Weyl.

Was read by Mr. Rees in the unavoidable absence of the authors.

This is supplementary to a paper by the same authors which was presented at the Folkestone meeting in May last.

In the previous paper it was suggested that the cracking of magnesite bricks during drying was caused by a volume expansion accompanying the formation of magnesium hydrate (brucite). X-ray analysis confirms the formation of brucite during souring, and the measurement of test-pieces before and after hydration shows a very considerable expansion.

The total expansion after drying and cooling is found to be greatly influenced by variations in draught (and hence of drying time).

The drying of test-pieces *in vacuo* shows the possibility of lowering the drying time without raising the temperature and hence the hydrate formations. The possibility of applying vacuum drying for large shapes is suggested.

Behaviour of Refractory Materials under Torsion at Different Temperatures.

By Dr. A. L. Roberts and Prof. J. W. Cobb, C.B.E.

The following is a summary (by the authors): .

An apparatus is described in which the behaviour of refractory materials under torsional stress has been investigated at temperatures up to 1050° C. The results of a preliminary examination of the following materials are reported:

Kaolin and mixtures of kaolin + calcined kaolin, kaolin + quartz, and kaolin + fireclay.

Fireclay and mixtures of fireclay + "grog" (crushed firebrick), and fireclay + quartz.

Transparent and translucent silica glass.

The test-pieces were fired, in a works kiln to cone 14 (*ca.* 1410° C.).

The resistance to torsional stress of all the materials, except kaolin, kaolin + calcined kaolin mixture, and silica glass, was found to increase as the temperature was raised, and to attain a maximum value at temperatures between 750° and 900° C. At temperatures within the range 800°-950° C. the torsional strength of all the materials, except fused silica, began to diminish, the decrease being pronounced at 1000° C., although even at this temperature the resistance of certain of the substances to torsion was greater than that at atmospheric temperature.

The observations suggest that the development of an increased resistance to shearing stresses, as the temperature is raised, is characteristic only of those materials examined which contain free silica in the crystalline condition, and that the magnitude of the change depends on the amount of crystalline silica present. The cause of the phenomenon is at present uncertain.

It also appears that the decrease in resistance to torsional stress, which commences in all cases except that of silica glass, at temperatures within the range 800°-950° C., corresponds to the beginning of softening of the materials. Vitreosil and transparent silica glass undergo a similar decrease in torsional strength at 980°-1020° C. and at approximately 1100°, respectively. It is considered possible that the decrease in torsional strength at 800°-950° C. may be due to a change in the properties of a siliceous glassy matrix.

The modulus of rigidity of all the materials has been determined at room temperature. Values of the maximum modulus of rigidity of the hot materials have also been calculated.

For practical purposes the results point plainly to the existence of two ranges of temperature in which the properties of such refractory materials as we have examined are different. In the lower range (roughly below 800° C.) the material is rigid and almost perfectly elastic. It will therefore either break under the stress (cracking or spalling) or return to its original form when the stress is removed. The stress may be applied externally or may be due to differences in the expansion of adjacent layers in the material where a temperature gradient exists. In the higher range of temperature (roughly above 1000° C.) the material develops a plasticity which allows stress to be accommodated. Warping and not cracking will then be the defect to be anticipated.

Influence of the Characteristics and Treatment of the Raw Material on the Properties of Fused Silica Products, and the Effect of Treatment of the Fused Products on Their Properties.

By Dr. Burrows Moore.

Volatile impurities are largely responsible for blisters and pinholes in products, and although never forming more than 0·1 p.ct. in passed raw material, a variation of less than 20 p.ct. of the amount present may cause differences in the products. Impurities to be extracted consist chiefly of sulphates and chlorides. Very small proportions of such impurities appreciably affect devitrification tendency.

Traces of metallic elements or their compounds in silica products may cause fluorescence, so that absence of fluorescence is an indication of purity of the silica material.

Many data are given representing the results of tests.

Presidential Address of Mr. A. Clement Hovey*

In addressing the members of this Association to-day, I do so with a special sense of appreciation of the high honour you have conferred upon me by electing me your President. I have been a member of the Association for thirty-five years. For half that time I have been engaged in the Gas Industry in other parts of the United Kingdom and abroad, yet I have had the advantage of keeping in close touch with the Association to which I have been for so long deeply indebted. I had the privilege of reading papers before you as long ago as 1903 and 1904. Those papers described new gas-works, and their working results, at Tynemouth, for the design and operation of which I was responsible under the late William Hardie, who was twice President of this Association. The works included overhead railways and machinery for the movement of materials, besides stoking and other machinery and apparatus for gas manufacture and subsidiary functions by which economy could be effected without undue capital expenditure. An era was then dawning in relation to the form of many of the requisites and methods of the manufacture, distribution, and utilization of gas. Nevertheless, I believe those works continue to give good service.

I propose to review, so far as time will permit, developments in the British Gas Industry and factors affecting it since the beginning of the century. There was then a general awakening of enterprise on the part of administrators, which has further gained in vigour as competition has become more formidable. The necessity has arisen for more scientific designs and processes and also guidance in the conduct of the affairs of the Industry.

Technical Education.

In the construction of a modern gas-works and its distribution system, many materials, articles, and trades being employed, costs and qualities must have the constant consideration of the engineer and the management. The predominating desire is to control an extremely efficient undertaking, commanding the goodwill of the public whom it serves in a vital degree in daily domestic and industrial life. Of supreme importance is the selection, training, and direction of staff and the development of design and process, with that continuity of effort and unremitting attention required of a public utility service. The technical education of assistants, including apprentices in the various trades employed in the Gas Industry, has had for many years bestowed upon it the earnest thoughts of managers in the Industry, because of the increasing magnitude and range of modern operations, which must be handled with all the efficiency attainable to withstand the tide of competition. Leaders of the past usually graduated in the school of almost unguided study and hard plodding experience. We know of admirable men of long and unfaltering service whose monetary recompense has not been, and is not to-day, commensurate with their achievements and responsibilities.

The Education Scheme of the Institution of Gas Engineers has been evolved during recent years to its present useful form. The Industry is indebted to those who accomplished this constructive work and to the Examiners who report to the Institution annually. Students in considerably increasing numbers are applying themselves assiduously to the curricula formulated. Diplomas and honours certificates are steps now necessary for the advancement of the aspirant, to enable him to accomplish the tasks which will confront him, whether they be technical or commercial. Our Hon. Member, Herbert Lees, for nineteen years Hon. Secretary of this Association, and present Chairman of the useful Special Purposes Section, conducted evening classes in gas manufacture and distribution at the Rutherford College, Newcastle-upon-Tyne, in the early years of this century, and there are many who remember with gratitude his patient and thorough instruction. Similar work has been done in other centres, generally by qualified men engaged in the Industry. The original work of the City and Guilds of London Institute in establishing examinations in gas manufacture and distribution, at a period when other such qualifications were unobtainable, is worthy of recognition. The Universities and Technical Colleges are assisting in equipping the Industry with enterprising and enthusiastic men who, after further experience and acquisition of additional knowledge, are entitled to encouraging remuneration.

The Gas Industry warmly acknowledges the comprehensive organization of Watson House of the Gas Light and Coke Company, which for several years has been a willing guide to other undertakings in certain branches of research, in the inspecting and testing of materials and fittings, and in the training of artificers in the many classes of work required in the operations of the Industry.

Leeds University.

The Livesey Chair of Coal Gas and Fuel Technology at Leeds University was inaugurated in 1908 as a permanent memorial to Sir George Livesey, who will always be remembered as an heroic character in the Gas Industry and the Protagonist of Co-Partnership in industry throughout the country. The Livesey Professor co-operates with the Research Committees of the Institution of Gas Engineers, which provides the funds for a considerable number of Research Chemists on the Staff of the Leeds University. In addition to the work done at the University, investigations are pursued by these chemists at gas-works, by invitation, in various parts of the country. Independently, undertakings now possessing splendidly appointed laboratories with their scientific staffs, are continually contributing to the fund of knowledge which is the foundation of progress. Industrial firms supplying plant, apparatus, and material for the use of the Gas Industry have their own specialized laboratories and experimental departments, upon which they spend large sums annually. Collectively, as the Society of British Gas Industries, they support efforts and movements essential to the soundness and expansion of the Industry. The Gas Research Fellowship at Leeds University of £200 per annum tenable for three years has been in existence since 1907, and the Corbet-Woodall Scholarship of £60 per annum since 1915. The Scholarship of £170 per annum perpetuating the memory of William Cartwright Holmes was first awarded

THE PRESIDENT,

A. Clement Hovey.

Mr. Hovey was educated at Wesley College, Sheffield, under Drs. Dallinger and Shera, and at Sheffield Technical College, where he was a pupil of Prof. Ripper. After two years with Sir Robert Hadfield he served articles with Messrs. John Abbot & Co., Ltd , Gateshead, and in 1897 he was appointed Assistant Engineer and Manager of the Tynemouth Gas Company. He designed in detail gas-works of 2½ million c.ft. per day capacity, and other smaller works. After eleven years with that Company he was appointed Chief Engineer of the Gas Undertaking at Milan, completing and putting in operation there large new works. In 1912 he joined Messrs. Wests' Gas Improvement Company, Ltd., Manchester. Mr. Hovey has twice travelled round the world in recent years in connection with his work. He has been a member of the North of England Gas Managers' Association since 1897, and a member of the Institution of Gas Engineers since 1905.

* Read before the North of England Gas Managers' Association, Oct. 7.

in 1930. A number of Medals are awarded by the Institution of Gas Engineers in recognition of work done.

Institution of Gas Engineers.

The Autumn Research Meeting of the Institution of Gas Engineers, the fourth of which is to be held next month, allows deliberate discussion of the reports of the Committees, upon those subjects into which research and investigation have been made during the annual period. The Institution of Gas Engineers, founded in 1863, received its Royal Charter only in 1929. Its membership of 812 in 1905 had risen to 1467 in 1931. By its numerous Committees and their reports, the papers read by members, together with its representation on technical bodies and special inquiries, it is responsible for an immense amount of informative work of scientific, educational, and permanent practical value. Broader powers should be authorized to embrace in its membership qualified technical men in the Industry who are, by its Charter, excluded. The now well-organized system can surely scarcely be surpassed by any other Technical Institution. Twenty District Associations, including eight Junior Associations, supplement the work of the Institution. The first of these Associations, the Waverley, was formed in 1861, and the first Junior Association was formed in Manchester in 1898. Technical and commercial matters of general and local interest have been dealt with in great detail to the advantage of the Industry, and the Associations have assisted in preparing members for those responsible appointments in the Industry which await the most competent. Two of our members, W. Doig Gibb and Thomas Hardie, in comparatively recent times have been Presidents of the Institution of Gas Engineers, and another member, Frank P. Tarratt, is President-Designate. We delight to have these members actively supporting our Association, to remember their high positions and their usefulness and loyalty to the Gas Industry.

Legislation.

Legislation is necessarily enacted for the control of public utility undertakings. The Gas Industry, however, has suffered severely from restrictive regulations of unsuitable character, which had been ordained and were retained by Governments which had not understood technical requirements and the changing conditions surrounding the Industry. Only by strenuous and persistent efforts by principal companies of the Industry, at great expense over lengthy periods, have more suitable governing stipulations been gradually agreed upon and reasonable facilities granted. There is, however, much more to be done to free the Industry further from obsolete regulations.

The Gas-Works Clauses Act of 1871 contains many requirements regarding the quality and testing of gas which are now superseded by the Gas Regulation Acts. Formerly provisions were inserted in Special Acts imposing restrictions additional to those in the 1871 Act, with regard to sulphur impurities and illuminating power. Following a Departmental Report in 1904 the London Gas Act was passed in 1905, under which the Metropolitan Companies were relieved from liability relating to sulphur impurities other than sulphuretted hydrogen. Acts were passed in 1906 and 1907 which respectively repealed the sulphur clauses of a number of undertakings, and others followed. In 1901 the South Metropolitan Gas Company, having obtained powers, reduced the illuminating power of the gas supplied by them to 14 candles, and the Commercial Gas Company obtained similar powers in 1902. The Harcourt Pentane Test Lamp was a notable invention which was authorized for use by a Notification of the Gas Referees in 1901. By substituting candles and balance it rectified and simplified photometrical tests.

The London Gas Act of 1905 also authorized the Gas Referees to prescribe the burner for testing the illuminating power of the gas supplied by the Metropolitan Companies, and that the burner should be so used as to obtain from the gas when consumed at the prescribed rate the greatest amount of light. This was an obviously needed reform. The burner prescribed was the specially designed Metropolitan Argand No. 2, which consequently superseded Sugg's London Argand No. 1. By 1908, owing to gas being so much used for cooking, heating, and power, all the Metropolitan Gas Companies had been empowered to reduce their standard from 16 to 14 candles. In 1910 standard burner Acts authorized 43 companies to substitute the No. 2 Burner. The 1905 Act provided for calorific power tests, and the Gas Light and Coke Company's Act of 1909 authorized a standard of calorific power for the gas supplied by that Company. Other companies and corporations slowly followed, the Morley Corporation, in 1913, being the first provincial undertaking to obtain freedom from the illuminating power standard.

National Gas Council.

The National Gas Council was formed in 1916. Since 1919 its President has been Sir David Milne-Watson, who, as Governor of the Gas Light and Coke Company and in other prominent positions, by his competence, versatility, and untiring zeal, has promoted the best interests of the Industry most admirably. The Council has been of far-reaching assistance in connection with Legislation; in discussions with Government Departments and Municipal and other Councils; in advising undertakings upon policy and dealing with other matters of much importance to the Gas Industry. An example of usefulness was the help afforded in passing through Parliament in the past Session of the Kettering Gas Company's Bill, which prevents the Local Authority imposing upon their tenants the restriction that gas should not be used in their houses. An instance in this district was the support of the Seaham Gas and Lighting Company's Bill in a successful appeal to the Ministry of Transport against the Electricity Commissioners, who refused to insert the Northumberland Clause previously granted by Parliament in other Bills. The effect of this clause is to oblige Local Authorities periodically to review financially their Electricity Department, and meet any deficit due to its operations by raising the price of electricity, thus avoiding balancing charges on the ratepayers generally. The Commissioners continued their reactionary policy in connection with other Bills, but the clause was eventually incorporated in each case and has since invariably been allowed. The South Shields Municipal Authorities applied in 1930 to the Ministry of Health for a large loan to convert public gas lighting to that of electricity. The National Gas Council supported the Gas Company in their successful resistance to such extravagant and inadvisable expenditure. Similar cases have been successfully contended against elsewhere.

Gas Regulation Act.

The Gas Regulation Act of 1920 facilitating procedure in transferring from the illuminating power standards of gas to those of calorific power, in providing for the increase of standard and maximum prices of gas, and making other provisions, is of exceptional importance. The Act simplified methods of obtaining modifications of powers by means of Special Orders. The inception of the therm system of charge resulting from the work of the Fuel Research Board, the Chairman of which was at that time Sir George Beilby, was a notable advance in gas legislation. Now comes the demand for a unit of gas equivalent to the thermal value of a unit of electricity. For assisting sales and for other purposes this is an important proposal. The Gas Undertakings Acts of 1929 and 1932 gave the Industry further financial powers. The Gas Legislation Committee appointed by the Board of Trade in February, 1931, to consider the recommendations contained in the 2nd Report of the National Fuel and Power Committee, and to report what amendments to existing gas legislation are desirable and necessary to give effect to these recommendations, continues its inquiry, and we hope proper freedom in conducting our affairs will be granted as the result of their labours. Methods of charging for gas used for different purposes, and for large consumptions, have been modernized in certain cases in recent years, so that terms are similar to those by which electricity has long been favoured. The Gas Industry is indebted to individual companies and again to the National Gas Council for their persistent efforts to obtain these facilities, necessary to conduct the business of the Industry to the general advantage.

Federation of Gas Employers.

The Federation of Gas Employers has acted for almost all undertakings since 1919, its Chairman being Sir David Milne-Watson. It has succeeded in settling with the representatives of the workmen, through the media of the national and regional Industrial Councils, rates of wages in the districts for the various grades, taking into account the widely differing conditions throughout the country. The negotiations, often protracted, have been conducted in a spirit which has maintained the harmony indispensable to unfailing public service. The National Joint Industrial Council for the Gas Industry was formed in 1919 under the same chairmanship as that of the Federation of Gas Employers. It consists of not more than 44 members, of which number one half is selected by the Federation of Gas Employers and one half by the Trade Unions. There are eleven Regional Councils, constituted on similar lines. All co-operate for speedy settlement of difficulties relating to wages, hours, and working conditions in the Industry.

British Commercial Gas Association.

The British Commercial Gas Association was founded in 1911. Its fine organization is ever ready to supplement

local efforts in numerous ways. Its annual and district conferences, attractive advertising, and other activities, provide a powerful appeal to the public in explaining the economy and convenient utility of gas. These invaluable influences form one of the mainstays of the Industry.

Gas Companies' Protection Association.

The Gas Companies' Protection Association was founded in 1898 and owes much to Dr. Charles Carpenter, who was its Chairman for many years. The Association has defended the rights of the companies and upheld the good name of the Industry. As President of the South Metropolitan Gas Company, Dr. Carpenter has helped forward the Gas Industry for a generation, in invention, in scientific process, and in initiating advantageous legislative precedent.

Co-Partnership.

Co-partnership was inaugurated in the South Metropolitan Gas Company 41 years ago by Sir George Livesey, the Company's Chairman who had been its Engineer, and who executed wonderful work, original, bold, and permanently beneficial. The South Suburban Gas Company, then the Crystal Palace District Gas Company, was the only other Gas Company which embraced Co-partnership before this century. Some sixty gas companies having an aggregate capital now nearing 90 millions sterling, have adopted this system, which has combined the interests of the investor and the employer, the employee and the customer. Forty-five thousand employees enjoy the benefits of the system. In 1930 there was divided among them over £400,000, and they had then capital of over 3 millions sterling in the Companies. Superannuation and pension schemes are growing in numbers and strength. Works Committees, welfare departments, canteens, institutes, clubs, sports grounds, and other amenities are provided, and directors and officials have done much to keep active the personal touch, convincing all concerned of their common interest. The encouraging and growing practice of appointing on Boards of Directors officials of ability and faithful service is strengthening administration.

Commercial Education.

The fifth International Congress on Commercial Education, at which 35 States were represented, was held in London last July, under the Presidency of Sir David Milne-Watson. Sir Francis Goodenough took a leading part, speaking with special reference to training in methods of salesmanship, of which he is the most expert exponent and sedulous organizer. Recent developments in salesmen's educational courses will bring reward to gas undertakings, and the Salesmen's Circles of the British Commercial Gas Association, each in its own district, exemplify methodical mutual aid.

International Conferences, &c.

The first International Gas Conference was held in London last year, and the first World Power Conference on Fuel was held at the International Exhibition, at Wembley, in 1924. At this and subsequent World Power Conferences the Gas Industry has played an important part in elucidating the vital problems confronting the preparation and utilization of fuel of all kinds. The Institute of Fuel was formed in 1927 by the amalgamation of two other Institutions. Its Founder-President was the First Baron Melchett, then Sir Alfred Mond, to whose unbounded capacity all chemical and allied industries owe much of their advance and security. It is co-operating with the Gas Industry, which has been of material assistance. The Institute of Chemistry, the Society of Chemical Industry, the Chemical Society, and the Institution of Chemical Engineers are closely connected to the Gas Industry, for many of those engaged in it are members of these bodies. The National Fuel and Power Committee appointed by the Board of Trade, under the Presidency of Lord Melchett, issued its Report in 1928. The recommendations contained are tending to improve the position of the Gas Industry.

Fuel Research Board.

The Department of Scientific and Industrial Research, appointed in 1915, has as a section the Fuel Research Board. The Gas Industry has been most interested in the work done at the Fuel Research Station, which is now of large dimensions and contains much experimental plant on full working scale. The work of the Board has been of great credit to a Government Department and of the highest value to the Gas and other industries. Its annual report is eagerly read by all interested in the technical development of those industries. The reports upon the colossal work of the Physical and Chemical Survey of the National Coal Resources, many of which are now issued, including those covering Northumberland and Durham, are excellent examples of scientific work representing a study of each seam. The modest grants from the State contributed towards the work of the Board are being expended in investigation which is amply justified and in directions upon which the industrial prosperity of the country depends.

British Standards Institution.

The British Standards Institution is the name adopted by the British Engineering Standards Association, formed in 1901, when its Royal Charter was received in 1931. The work of the Institution is facilitated by three sections, the Engineering, Building, and Chemical Divisional Councils. That of Engineering is subdivided in a series of Committees, one of which is for the Gas Engineering Industry. Discussions with the Dominions are resulting in the formation of a complete system of Empire unification of Standards. The original Association was formed to assist producers and users in the improvement and simplification of engineering and industrial materials, economy in design, avoidance of unnecessary variety and patterns and sizes of articles, and to set up standards in engineering and allied industries. The Government Department of Scientific and Industrial Research has as a branch the Steel Structures Research Committee, upon which serve many eminent men, making recommendations to the Ministry of Health. It works in co-operation with the British Standards Institution Engineering Section, and the Institution of Structural Engineers. Its first report was issued in December last upon steelwork for buildings, the report being published by H.M. Stationery Office. Besides Government grants this national work is supported by professional institutions and industrial organizations and by the sale of publications. The choice of any course of investigation is decided by a consensus of opinion, and the community of interests of producer and purchaser is kept constantly in view. Gas-works buildings and structures being generally exempted from building by-laws, the recommendations are guides in economical and safe design. More refined methods of stress calculation have led to the adoption of precise factors of safety, so encouraging a higher standard of design.

Structures.

An example of valuable guidance is that in making provision against wind pressures upon structures and buildings; upon which subject the engineering world is indebted to J. O. V. Irminger, of Copenhagen, who read a paper at the Annual Meeting of the Institution of Gas Engineers in London in 1899, and who has pointed the way in research in this important subject.

The definite high standard qualities of British steel being recognized, the design of buildings has been revolutionized, and the architecturally attractive retort and engine houses in gas-works of the past have been superseded to a large extent by light shells protecting plant and operators within. Walls a few inches thick of brick or concrete combined with steel framework or reinforcement, have been proved against the highest wind pressures, and cost and space occupied have been saved. Standardization of steel sections in 1904 simplified designing work and widened the source of supply. A further advance was made in 1920 and again only this year by the revision of standards. The useful broad flange beam has not yet been rolled in this country although the mill for rolling it was invented by Grey, an Englishman. Prices of steel sections and plates are within 15 to 21 p.ct. of those of 1913. Welding in preference to rivetting has effected a saving in labour and material and simplified design in certain structural work, including gasholders and tanks, and it is now commonly used for jointing steel gas mains. The parts of a railway bridge on the line between Newcastle and Carlisle were connected by welding last year, and the days of rivetting appear to be numbered. Coal gas is coming more into use for welding purposes, but the *quasi*-arc system is in general use. Thorough examination by X-ray seems essential for dependence on thick welds by such methods for high tensile and pressure stresses.

Reinforced Concrete.

Reinforced concrete is in evidence in gas-works for walls, tanks, purifiers, gantries, and other items, besides foundations. The first patent in this material, used for fire resisting, was granted in 1854 to W. B. Wilkinson, of Newcastle-upon-Tyne, who afterwards became Chairman of the Gas Company. Reinforced concrete piles, pre-cast

or formed *in situ*, are most common, and cylindrical reinforced sections are now used for driving to varying depths and afterwards filled. Rafts carrying extremely heavy plant and buildings are constructed where piles are impracticable, floating the whole weight at a constant level. Hennebique of Paris made his first application in 1879, but his first patents were granted only in 1892. The first recorded steel skeleton construction in this country was a warehouse at Stockton-on-Tees in 1898, and a larger one was built at Newcastle-upon-Tyne in 1900.

Standard Contract Clauses.

Standard Clauses of Contract adopted by the Institution of Gas Engineers and the Society of British Gas Industries in 1909, and revised in 1917, have facilitated the conduct and completion of contracts in every department.

Coal.

The Gas Industry is dependent, particularly in this district where so much is raised, upon the price and quality of coal; so we naturally desire that the trade should flourish. That condition can only again be reached by larger output reducing costs, by cleansing processes and other improvements being extended, and by freedom of working the pits. Continual and inexpert outside interference over a long period of years has discouraged enterprise and development, depleted reserves, and depressed those keen and competent mining engineers and managers, for whose qualities we have much admiration. More than half the coal raised in England, and more than one-third of that in Great Britain, is mined in the three counties of Northumberland, Durham, and Yorkshire—within the area embraced by this Association. The tonnage of coal disposable commercially in the country in 1931 was 196 million tons, and its net selling value at the collieries was 137 millions sterling. The average selling price, therefore, was 14s. per ton, and the profits, before debenture interest and other charges were allowed, was 3·4d. per ton. The total output in 1930 compared with that in 1913 was less by 43½ million tons. Last year, although prices were lower, it was further reduced by 24 million tons, or a total reduction since 1913 of over 23 p.ct. This percentage would have been greater had not improved plant and engineering and other technical methods been largely adopted in the mining industry.

To-day we shall see a thoroughly up-to-date colliery at Horden, with those refinements of plant and procedure which cannot fail to convince everyone of the high standard of scientific and practical efforts, which have evolved this admirable illustration of expert competence and consideration for those engaged in the industry. The daily output of this colliery is over 6000 tons, and a dry coal is available, having a uniform ash content not exceeding 6·5 p.ct. Uniform and low percentage of ash content has long been desired, and the British Standard Specification, recently published by the British Standards Institution, for the sampling of coal and the determination of the fusion temperature of coal ash, will be to the common advantage. The Institution of Gas Engineers and the National Gas Council took part in the preparation of this specification.

Plants for the economical hydrogenation of coal and tar would be so large and costly that their construction is improbable at present. The great Company, Imperial Chemical Industries, Ltd., which has its largest works in this district, has conducted experiments on a substantial scale. With further economies which may be devised in this method of home production of petrol a new great industry may be created among us. To provide for the petrol needs of the country, amounting to over 900 million gallons, some 20 million tons of coal would be required and immense quantities of hydrogen from coke. By such means as have been mentioned, the use of powdered and composite fuel, and extension of the excellent mechanical stokers, we hope the return of the coal trade to prosperity may be realized.

Gas under compression up to 200 atmospheres in steel cylinders under the bodies of motor vehicles is undergoing trials, the quantity of gas carried being equivalent to nearly 9 gallons of petrol. This system at present working at 1800 lbs. pressure per sq. in. seems likely to be an additional good customer for gas, adding to the demand for coal and to our internal trade, in preference to importing petrol.

Prices of coal delivered to large gas-works in this district at the end of last century were 8s. to 9s. per ton. The cost immediately pre-war was 3s. to 4s. more, but after the war prices rose to unprecedented heights. Falling again, however, in 1929 to 21s., they have steadily descended to less than 16s. per ton delivered to-day. The Gas Industry anxiously watches the prices, wishing to avoid a burden which would bear it down in its competition, particularly with imported oil.

Railway Rates.

Railway prosperity and facilities are important in this district of heavy basic trades, the birthplace of George Stephenson and of the locomotive steam engine. The railway rates for coal and gas coke which remained unaltered during the war were in 1920 raised in two stages to 100 p.ct. above pre-war level, *plus* a flat addition of 6d. per ton. The maximum increase, however, for any distance was 4s. Subsequently, reductions and adjustments were made so that by February, 1927, the rates were 60 p.ct. *plus* 2d. above those of 1913. In 1928 an entirely new scale of rates was brought into operation, but wherever the 1927 rates were lower these lower rates continued. Some rates are now lower than either the 1927 or 1928 figures. The de-rating relief to industries is not retained by the Railway Companies, but is passed on to traders and the rebates on coal and coke for export and for iron and steel works are allowed. Coke ovens, although competing with gas undertakings in their products, receive these rebates, and their works are de-rated, but the works of the gas undertakings are not de-rated. The 20-ton wagon was recommended as standard by the Standing Committee on Mineral Transport in 1929 mainly to reduce railway and carriage costs. The percentage of 20-ton wagons is slowly increasing, being 13½ p.ct. in the last return.

Carbonization.

Carbonization, being the major operation in coal gas manufacture, requiring the largest expenditure of capital, of supervision, and of labour, of any section of gas-works plant, has received the closest attention from engineers and chemists from the earliest times. Horizontal retorts were almost alone used until towards the end of last century, when inclined retorts came into vogue to some extent. There are, however, few inclined retorts now carbonizing coal in this country, owing to well-known objections. The advent of the vertical retort in the early years of this century as a practical proposition solved the problem of charging and discharging by gravity, but it caused the further development of the horizontal retort and details in connection with it.

Elevating, conveying, and stoking machinery had then, after strenuous endeavour under most adverse circumstances for some thirty years, reached a surprising state of perfection and had greatly reduced labour of a most arduous character. Stoking machinery, owing to the complicated movements and the severe conditions imposed upon it, was the most critical mechanical section. The mechanically operated scoop and rake, known as the "iron man," did their work right well; and their movements were rapid and spectacular. The necessity for still higher efficiency and further reduction of costs caused the invention of other types of machines which have allowed the filling of retorts with coal entirely and their discharge by one machine and in one operation. This development, coupled with larger retorts and regenerative settings, with modified fittings and other refinements under more highly trained supervision, has maintained this type of plant in service in some cases to the exclusion of newer forms. Two tons of coal carbonized per retort per day is frequent practice in the larger installations, and a considerable increase on the capacity of thirty years ago. The therm output per ton of coal has been considerably increased, with lower fuel consumption and less labour costs.

Vertical retorts in the shale oil industry in Scotland, with which the name of William Young is identified, were in use more than half a century ago, and attempts were made to use them in gas-works, but they were not sufficiently suitably adapted to gas-works requirements until the time already indicated. Intermittent and continuous vertical retorts were then evolved which competed with the horizontal and inclined forms. The methods of controlling the heating, the machinery and fittings for coke extraction and coal inflow, and other items, were rapidly developed. The continuous system began to take precedence over the intermittent until at the present time more than 60 p.ct. of the coal gas manufactured in the United Kingdom is produced in continuous verticals. The use of intermittent retorts has been recently revived, mainly in the larger sections. A denser coke is produced with less breeze content, but it is not so readily ignitable as coke from continuous vertical retorts. Steaming in both forms, especially in the most suitably shaped continuous retorts, has greatly helped the efficiency. The work of our member J. E. Blundell, at Macclesfield in 1916, gave an impetus to this process which is of extremely high value, permitting much greater thermal yields of gas from almost all coals. The constancy of the calorific value

which is readily maintained from the continuous retort is a satisfactory feature. Ground space occupied has been greatly reduced by the vertical system of carbonization so that the capacity of works on restricted sites has often been more than doubled. Labour has also been reduced, and the cool coke discharged from continuous retorts is a distinct advance on the hot discharge from intermittents. The retorts are being made of capacity up to 10 tons of coal carbonized per day. The use of surplus heat boilers in connection with verticals, and referred to elsewhere, has further increased the efficiency of the system. In a paper read before the Institute of Fuel Technology in 1926, Thomas Hardie, the Chief Engineer of the Gas Light and Coke Company, stated the following commercial efficiencies of process:

	Efficiency P.Ct.
1. Carbonization of coal in continuous verticals with waste-heat recovery	85·6
2. Gasification of coke and oil for the production of carburetted water gas with waste-heat recovery .	69·2
3. Horizontal retorts with waste-heat recovery . . .	82·5

Without waste-heat recovery the C.W.G. process would be 59·9 p.ct.

Carburetted and blue water gases continue to be manufactured principally to assist in regulating coke stocks and as stand-by for other plant. The process has been developed by new designs, methods of operation, and automatic control and waste-heat boilers.

Complete carbonization plants were supplied in considerable numbers to the small gas-works in the emergency of war time and high costs, but the low quality of gas produced and the need for careful selection of classes of coal which could be used successfully, also the absence of residuals, have limited the extent of their adoption.

Coke ovens carbonizing 1200 tons of coal daily at the Beckton Works of the Gas Light and Coke Company were formally inaugurated by the Prince of Wales early this year. These works, which the King and Queen have also honoured by a visit, continue to be the largest in the world, and have manufactured 106 million c.ft. of gas in one day. The ovens and their very extensive and complete subsidiary plant were exhaustively described by E. G. Stewart to the Institution of Gas Engineers in 1931. This innovation in gas-works carbonizing plant in this country is of exceptional interest, and we admire the initiative, skill, and courage exemplified by this unique installation.

Dilution of coal gas by producer and other gases high in inert constituents is objectionable, although the procedure has been followed in very minor degree.

Producers with rotary mechanical grates have been in operation at several works for some years. The Trefois type at the Partington Gas-Works, Manchester, is gasifying coke breeze for heating horizontal retorts. The cost of such producers and their ancillary plant, the labour required, and the space occupied have to be considered in adopting this form in preference to step grates, in which breeze can also be gasified.

Surplus Heat Boilers.

In 1898 one of our present active members, C. Dru Drury, described to us a system of surplus heat recovery by egg-ended and Lancashire boilers hung over horizontal direct-fired retort settings at Sunderland. One of these boilers saved 20 tons of fuel weekly. The installation of regenerative settings, and the utilization thereby of much of the heat, reduced the thermal efficiency of this particular boiler system too low. Twenty years later, however, fuel being of much higher market value and larger quantities of steam being required in the more modern gas-works, including steam for vertical retorts, attention was directed to boiler design with fans for induced draught. So efficient are the high-velocity fire-tube boilers that several hundreds are now working in conjunction with carbonizing plants in this country, and they are saving per annum over one million tons of fuel. The result of the system is equivalent to a reduction of carbonizing fuel of over 40 p.ct. All the steam required in some gas-works is supplied by surplus heat boilers, the yield of steam depending on the type of retort setting, but the average is over 1200 lbs. per ton of coal carbonized. The smaller gas-works are using natural draught fire-tube boilers in connection with vertical retort settings. Water-gas plants in many cases have been fitted with surplus-heat recovery boilers increasing the efficiency of the process about 10 p.ct.

(To be concluded.)

Corporation Undertakings' Results

Accrington.

The auditor's report of Accrington and District Gas Board shows a turnover slightly less than the previous year. There was a reduction of gross profit by £1848. The state of trade had been a serious factor in the reduction of profits, but the position had been assisted by a reduction in the cost of distribution. A net profit of £3515 was made upon the year's working. Mr. A. J. Harrison, the Manager, said that August marked a record for sales in the showroom. They sent out 66 cookers, 25 water heaters, 23 wash-boilers, three fires, and one griller, a total of 128.

Airdrie.

During the past year the amount of gas made was 142,774,000 c.ft., as against 147,780,000 c.ft. last year, a decrease of 5,006,000 c.ft., or 3·38 p.ct. The coal carbonized amounted to 8052 tons, compared with 8442 tons, a decrease of 392 tons on the previous year. There was also used in the manufacture of carburetted water gas 6537 gallons of oil, compared with 8284 gallons during the previous year, a decrease of 1747 gallons. The yield of gas per ton of coal carbonized, including carburetted water gas from coke and oil, was 17,731 c.ft., as compared with 17,495 c.ft. during the previous year, an increase of 236 c.ft. The total quantity sold was 134,362,700 c.ft., compared with 138,494,900 c.ft. for the preceding year, a decrease of 4,132,200 c.ft., or 2·26 p.ct. The gas consumed through industrial meters was 7,006,800 c.ft., compared with 7,974,000 c.ft. last year, a decrease of 976,200 c.ft., or 12·12 p.ct. Public lamps consumed 9,991,100 c.ft., as against 9,686,000 c.ft. for the previous year, an increase of 305,100 c.ft., or 3·15 p.ct. The total income of the Undertaking amounted to £34,202, as against £35,812 for the previous year, being a decrease of £1609. The total expenditure under net revenue account amounts to £8556, as against £8353 last year, an increase of £202. The amount at the credit of the net revenue account being £8879 (which is inclusive of £274 brought forward from last year), and, the total charges being £8566, a credit balance of £312 is carried forward to next year.

Blackpool.

The gross profit of the department for the year ended March 31, 1932, is £36,281, and after deducting interest and sinking fund charges of £21,720, income-tax, &c., of £3675, there remains a net profit of £10,885, and this amount added to the sum of £9518 carried forward in the appropriation account for March 31, 1931, gives a balance of £20,404. Of this amount it is proposed to transfer £5000 in aid of the rates, and to carry forward to the next year's accounts the balance of £15,404. The net capital indebtedness at March 31, 1932, was £223,739. The average price received for all gas sold amounted to 6·52d. per therm net, which is equivalent to 2s. 5·36d. per 1000 c.ft. During the year 66,289 tons of coal have been carbonized, and the total cost of coal was £75,029, which is equivalent to an average cost of 22s. 7·64d. per ton, as against an average price of 22s. 10·77d. per ton last year. The total amount of oil used in the carburetted water gas plant during the year has been 82,244 gallons at a cost of 3·78d. per gallon, as against 131,419 gallons used last year at an average price of 4·10d. per gallon. During the year there has been an increase in the gas sold of 30,299,700 c.ft., equal to an increase of 2·6 p.ct. At March 31, 1932, there was a total of 31,376 consumers; 20,557 of these are supplied with ordinary meters, and 10,819 are provided with prepayment meters. During the year 1322 new consumers have been connected to the supply mains; 713 ordinary meters have been changed to prepayment meters and 118 prepayment meters have been changed to ordinary meters. The average consumption per ordinary meter was 41,061 c.ft., and the average consumption per prepayment meter was 24,490 c.ft. The number of street lamps within the Borough is now 4217, and in the Marton Area 121, and accounts for 62½ million c.ft. of gas used. A total of 208 new lamps have been erected during the year in the area of gas supply, including 41 in the Marton Area.

Chesterfield.

The net cost of gas into holders produced at the works is slightly increased by 0·15d. per 1000 c.ft., due to the small increase in the price of coal and the reduction in values of coke and sulphate of ammonia; otherwise working results are good; one redeeming feature is the improvement in tar values. An increase in the gas sent out, as also in the gas paid for, is recorded, but the average price per therm received is less by 0·22d. Gas unaccounted for shows an increase, but is 0·14 per cent. below the average for the past eight years. A supply of gas in bulk to the Bolsover Gas Company has been given since

Nov. 11 last, and a supply of steam in bulk to the Holmebrook Mills from Dec. 7, under agreements.

Glasgow.

The sixty-third annual report and balance sheet of the Gas Undertaking, which embraces the year from June 1, 1931, till May 31, 1932, shows that the gross revenue amounts to £1,561,311 and the gross expenditure to £1,280,739, to which is added depreciation written off capital assets £142,500. The balance carried to profit and loss account is a credit of £138,071. The Committee had to meet the following requirements during the year: (1) Annuities on stocks, £16,688; (2) Interest on borrowed money, &c., £75,638; (3) Sinking fund, £136,320, leaving a deficit on the year's operations of £90,576. The quantity of coal carbonized during the past year was 550,450 tons, as compared with 578,432 tons for the preceding year, a decrease of 27,982 tons. The quantity of coal gas made per ton of coal carbonized was 14,967 c.ft., which, with water gas, gave an average of 15,472 c.ft., as compared with 14,969 c.ft. and 15,482 c.ft. respectively per ton for the previous year. The quantity of gas delivered and accounted for during the year amounted to 8,517,019,965 c.ft., as compared with 8,776,404,482 c.ft. for the preceding year, a decrease of 259,384,517 c.ft., equal to 2·9 p.ct. The unaccounted-for gas during the year was 7·5 p.ct., as compared with 9·5 p.ct. for the preceding year. The greatest quantity of gas sent out during the year in 24 hours was 37,514,000 c.ft. The maximum daily make of gas was 34,843,000 c.ft. The net sum realized from the sale of coke this year amounts to £130,731, being £33,395 less than that of the preceding year. The total quantity of coke sold this year was 206,714 tons, compared with 223,990 tons for the previous year, a decrease of 17,276 tons. The number of ordinary meters in use on May 31 last was 193,839 as compared with 200,955 for the preceding year, a decrease of 7116. The number of pre-payment meters in use on May 31 last was 127,772 as compared with 118,716 for the preceding year, an increase of 9056, giving a net increase of 1940 meters.

Stockport.

The price of gas was reduced as from Dec. 31, 1931, by deducting the rebate for prompt payment of 1·3d. per therm, or 6d. per 1000 c.ft., from the price for gas and from the resultant reduced price allowing 2½ per cent. for prompt payment, which is equivalent to a reduction of approximately 1d. per 1000 c.ft. The total expenditure on revenue account during the year amounts to £187,056, against £184,893 for 1930-31, while the income has been £235,744, against £234,041, producing a trading profit of £48,688, against £49,148. After deducting interest and sinking fund charges, £34,976, the balance is £13,711, to which must be added the income from sundry rents, and bringing forward £4632, the net profit amounts to £20,828. The amount of coal carbonized during the year was 59,694 tons, and the total quantity of gas made was 5,192,280 therms, or 1,153,840,000 c.ft., being an average make per ton of 82·83 therms, or 18,408 c.ft. per ton. There was an increased sale of 134,307 therms, or 29,845,900 c.ft. over last year, the total sold being 4,825,577 therms, or 1,072,350,500 c.ft., against 4,691,270 therms, or 1,042,504,600 c.ft. in 1930-31, with an increased revenue of £603. The unaccounted-for gas shows 3·73 per cent., compared with 5·08 per cent. last year, equivalent to a saving of 15,373,100 c.ft.

Swadlincote.

The annual report of the Swadlincote Urban Council Gas Undertaking for the year ended March 31 last shows that the working expenses, including the usual charges against revenue, totalled £14,335, as against £15,345 in 1931, and income £18,954, as compared with £19,690, giving a gross profit of £4619. Loan repayment of interest, &c., was £4858, while an amount of £595 was expended on new mains, &c. The previous year's loss was £1803, and provision had been made in the past year's estimates for a loss of £1000, but the net loss had only amounted to £834. Gas sold during the year represented 82 p.ct. of the total make, and while the latter was somewhat less than in the previous year, sales were slightly higher, and the quantity unaccounted for by leakage was 16·75 p.ct., compared with 19·48 p.ct. in the previous year. The overdraft on the Bank had increased from £8371 to £9985, but there was owing by purchasers of cookers, &c., on the hire system an amount of £7698, while apparatus of the value of £2275 was installed during the year.

Teignmouth.

The gross profit for the year was £6496. The interest and repayment of the capital reduced this by £4214, and income-tax was £758, leaving a net profit of £1524. This added to the credit balance at March 31, 1931, of £3141 makes the credit balance now £4665. The gross income was £26,557 and the expenditure £25,032. No new capital was taken up during the year, and the capital now stands at £38,615. The price of gas remained the same during the year, the net average price being 11d. per therm for ordinary meter consumers and 13d. per therm for slot meter consumers. The total amount of gas sold was 88,465,500 c.ft., or 308,094 therms, and for the first time for many years is a decrease amounting to 1·3 per cent. The average consumption per consumer was: Ordinary meter consumers, 184 therms—decrease, 0·5 per cent.; slot meter consumers, 113 therms—decrease, 4 per cent. The number of consumers increased by 22 to 2578.

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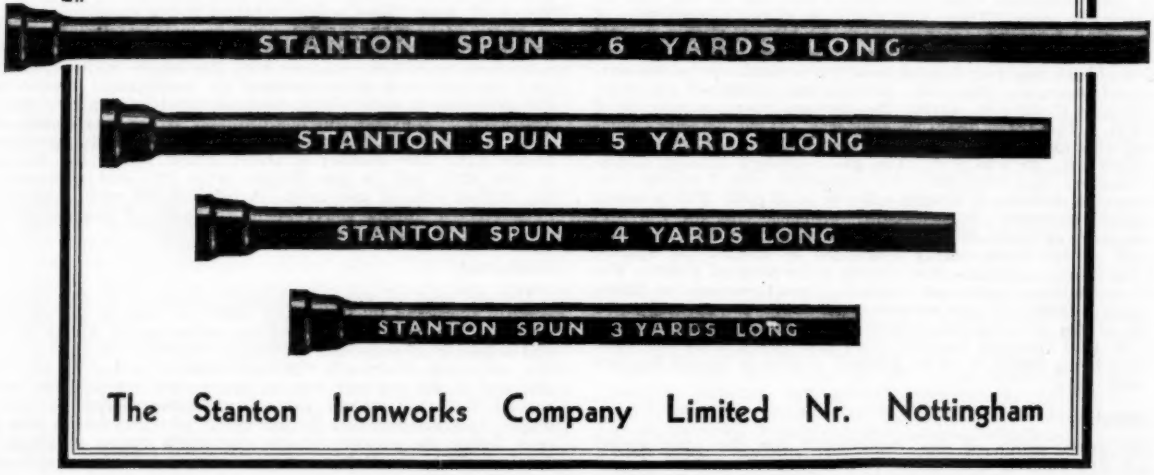

The Stanton Ironworks Company Limited Nr. Nottingham

Colonial Gas Association, Ltd.

Advice has been received by cable from the Head Office of the Colonial Gas Association, Ltd., in Melbourne, respecting the operations of the Association during the year ended June 30, 1932.

The Directors' report states that after providing for depreciation, &c., the balance at credit of revenue account is £107,059. Adding the balance brought forward from last year—viz., £22,458—and deducting bank, loan, and debenture interest, and after payment of interim dividend of 4 p.ct. and 3 p.ct. for the half-year ended Dec. 31, 1931, paid in April last on the preference and ordinary shares respectively, the amount at credit of the net revenue account is £67,765.

The Directors recommend as follows: (*a*) That a dividend at the rate of 8 p.ct. per annum (less interim dividend of 4 p.ct. for the half-year ended Dec. 31, 1931) be paid on the preference shares; (*b*) that a dividend at the rate of 6 p.ct. per annum (less interim dividend of 3 p.ct. for the half-year ended Dec. 31, 1931) be paid on the ordinary shares; (*c*) that £13,500 be set aside for Australian income-tax on profits earned to June 30, 1932; (*d*) that £1000 be added to the reserve fund; and (*e*) that the balance, approximately £22,698, be carried forward to the next account.

The sales of gas show a decrease of 6·36 p.ct. on the sales for the preceding year, and the sales of gas for the subsidiary companies a decrease of 8·03 p.ct. The report also mentions that the price of gas was reduced during the year to several of the Association's works and subsidiary works. The report further states that the expense account allows for expenses in connection with the high rate of exchange on London.

In accordance with Counsel's advice, application was made during the year to the Supreme Court of Victoria for a judicial decision in regard to the effect of certain provisions of the Victoria Finance Emergency Act concerning the payment of interest on debentures at the full covenanted rate. In consequence of the decision of the Supreme Court the contracted rates of interest on debentures issued by the Association in England and Australia are unchanged. The costs of this litigation are included in the Melbourne administrative expenses.

Gas Companies' Results.

Cirencester.

The revenue account of the Cirencester Gas Company, Ltd., shows a profit on the year's working of £8093. Interest on the debentures and the interim dividend at the statutory rate have been paid, and the Directors recommend a final dividend at the rate of £14, £7, and £9 16s. per cent. on the several classes of shares respectively, making £12, £6, and £8 8s. per cent. for the year. The sale of gas continues to show a satisfactory advance.

Deal and Walmer.

After another satisfactory year, the Ordinary Annual General Meeting of the Deal and Walmer Gas Company was held at the Office of the Works in Cannon Street, Deal, on Sept. 23, when Mr. G. T. Hannaford (Chairman of the Directors) presided. In presenting the Directors' report, statement of accounts, and balance-sheet for the year ended June 30, the Chairman said: Your Company's business, while showing a slight decrease in the sale of gas during the year under review of 1½ p.ct., shows a very satisfactory result. The gross profit (after providing for depreciation, as permitted by the Acts, and adding contributions to special purposes, benefit, and renewal funds), amounts to £11,320, which constitutes a record for the Company. Taking the capital account first, it will be seen that the sum of £8162 has been expended, of which approximately £6500 is on account of the second installation of vertical retorts. The number of consumers' meters in use is now 5411. The capital account itself shows a credit balance of £4335, as against £4830 for the previous year. Turning to the revenue account, on the debit side the gross cost of coal amounts to £17,958, as against £20,486 for the previous year. Manufacturing charges aggregate to £7701, as against £7236 for the previous year, an increase of £465, due to retort repairs. Rents, rates, and insurances show a reduction of £247, compared with the amount for the previous year. This year the contribution to the renewal fund amounts to £500, and that to the benefit fund to £379. The total expenditure amounts to £38,399, a reduction of £3597 compared with that for the previous year. The revenue account shows a credit balance of £11,320, as against £8843 for the previous year, an increase of £2476. The Chairman proposed that the accounts for the year ended June 30 be received and adopted; also that a dividend on the preference stock of 6½ p.ct. per annum, be declared for the half-year ended June 30, and that a dividend on the ordinary stock be declared at a rate of 7¼ p.ct., less the interim dividend paid in March.

Ludlow.

The Ludlow Union Gas Company, Ltd., report that in spite of the severe trade depression the business of the Company has been well maintained, and the profits had been increased by nearly £500, as compared with last year. During the year 45 new consumers had been added, and the price of gas further reduced with the introduction of a "block" system whereby the greater the consumption of gas the less the price charged. The Directors have declared the following dividends: 8 per cent. on ordinary "A" shares; 5 per cent. on preference "B" shares; 4 per cent. on ordinary "C" shares; and 6 per cent. on preference "D" shares.

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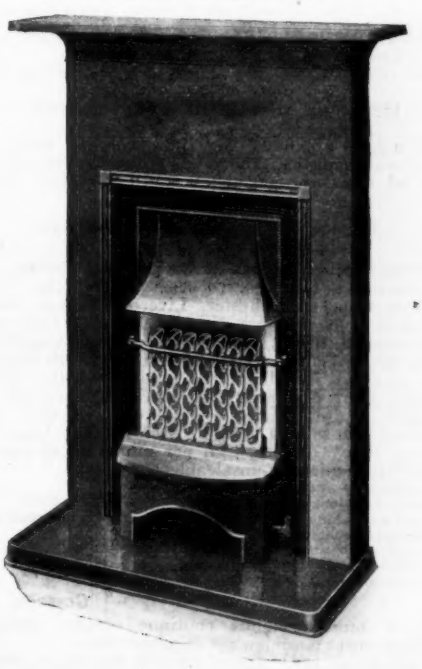

GAS MARKETS & MANUFACTURES

Stock Market Report.

[For Stock and Share List, see later page.]

The volume of business on the Stock Exchange last week was smaller than of late and quotations fluctuated daily in almost every section. The underlying tone, however, was strong, and in the absence of sellers at lower levels prices rapidly recovered any temporary set-back. The feature of the week was the re-opening of the new issue market, and the four prospectuses submitted each met with a prompt over-subscription. Many other new issues are stated to be in the course of preparation, and were it not for the conditions laid down by the authorities when removing the embargo, the market would doubtless be flooded with prospectuses to the detriment of the investor and the issuing concern.

Gas stocks and shares were a firm market, and recorded transactions more numerous than during the past few weeks. Prices still continue to harden, and the general tendency is a narrowing of the margin from 10 to 5 points. Apart from an *ex* div. reduction there were no falls, and the only rise of note was a gain of 2s. to 22s. in Bombay £1 shares, which on the basis of last year's dividend of 8 per cent. gives a yield of a little over 7½ per cent.

In last week's report a table was given showing the large appreciations in value which have accrued during the past six months in a number of ordinary stocks. The following ordi- illustrates the position with regard to some of the leading irredeemable debenture stocks which during the same period have improved in the aggregate about 16 points:

—	Price—		Rise.
	April 9.	October 7.	
Alliance and Dublin 4 per cent.	72½	85	12½
Bristol 5 per cent.	101½	117½	16
Commercial 3 per cent.	60½	72½	12
Croydon 5 per cent.	100½	117½	17
Gas Light 3 per cent.	65½	78½	13
Newcastle 3½ per cent.	67½	85	17½
South Metropolitan 3 per cent	61½	77½	16
South Suburban 5 per cent.	101½	118½	17
Wandsworth 5 per cent.	101½	117½	16

Current Sales of Gas Products.

The London Market for Tar Products.

LONDON, *Oct.* 10.

The prices of tar products for the current week are as follows: Pitch is firm at 97s. 6d. to 100s. per ton f.o.b.

Creosote is 3½d. to 5d. per gallon f.o.b., according to specification.

Refined tar is 4d. to 4½d. per gallon in bulk at makers' works.

Pure toluole is about 2s. 7d.; pure benzole, about 1s. 11d.; 95/160 solvent naphtha, about 1s. 7½d.; and 90/140 pyridine bases, 3s. 9d. to 4s.—all per gallon naked at makers' works.

Tar and Tar Products in the Provinces.

Oct. 10.

The average prices of gas-works products during the week were: Gas-works tar, 33s. to 38s. Pitch—East Coast, 85s. f.o.b. West Coast—Manchester, Liverpool, Clyde, 85s. f.o.b.* Toluole, naked, North, 1s. 7½d. to 1s. 9d. Coal-tar crude naphtha, in bulk, North, 5½d. to 5¾d. Solvent naphtha, naked, North, 1s. 4d. to 1s. 4½d. Heavy naphtha, North, 10½d. to 11d. Creosote, *ex* works, in bulk, North, liquid and salty, 2½d. to 2¾d.; low gravity, 1¼d.; Scotland, 2¼d. to 2¾d. Heavy oils, in bulk, North, 4¾d. to 5¼d. Carbolic acid, 60's, 1s. 6½d. to 1s. 7d. Naphthalene, £9 to £10. Salts, 55s. to 75s., bags included. Anthracene, "A" quality, 2½d. per minimum 40 p.ct., purely nominal; "B" quality, unsaleable.

* All prices for pitch are now quoted on the basis of f.o.b. In order to arrive at the f.a.s. value at any port it will be necessary to deduct the loading costs and the tolls whatever they may be.

Tar Products in Scotland.

GLASGOW, *Oct.* 8.

Values of most products continue steady, although the volume of business is somewhat disappointing.

Crude gas-works tar.—Actual value is 47s. 6d. to 50s. per ton *ex* works.

Pitch.—The market continues firm, but supplies are short in this district. Export price is nominal at 85s. to 90s. per ton f.o.b. Glasgow, and home value is round 90s. to 100s. per ton *ex* works, according to quality.

Refined tar to Ministry of Transport Specification is valued at 3¾d. to 4¼d. per gallon f.o.r. naked, but orders are scarce.

Creosote oil.—While prices are fairly steady there is not much business being placed at present. B.E.S.A. Specification is 3½d. to 3¾d. per gallon; low gravity, 3¾d. to 4d. per gallon; and neutral oil, 3¾d. to 4d. per gallon—all *ex* works in bulk.

Cresylic acid is only in moderate call, with quotations irregular. Pale, 97/99 per cent., is 1s. to 1s. 1d. per gallon; dark, 97/99 per cent., 11d. to 1s. per gallon; and pale, 99/100 per cent., 1s. 2d. to 1s. 3d. per gallon—all f.o.r. in buyers' packages.

Crude naphtha.—Value keeps steady at 4½d. to 5d. per gallon, according to quantity and quality.

Solvent naphtha.—90/160 grade is 1s. 2d. to 1s. 3d. per gallon, and 90/190 grade is 11d. to 1s. per gallon.

Motor benzole.—Price in this district is 1s. 4d. to 1s. 5d. per gallon f.o.r. in bulk.

Pyridines.—90/160 grade is 3s. to 3s. 3d. per gallon, and 90/140 grade 3s. 3d. to 3s. 6d. per gallon.

Benzole Prices.

These are considered to be the market prices for benzole at the present time.

	s. d.		s. d.	
Crude benzole	0 10½	to	0 11	per gallon at works
Motor "	1 6½	"	1 7	" " "
Pure "	1 10	"	1 11	" " "

Contracts Advertised To-Day.

Coal.

The Kirkby-in-Ashfield Urban District Council invite tenders for the supply of gas coal. [Advert. on p. 168.]

Gasholder and Tank.

The Rothwell Urban District Council invite tenders for the supply of a gasholder and tank. [Advert. on p. 168.]

Re-sheeting of Holder.

The Lisburn Urban District Council invite tenders for the re-sheeting of an inner lift. [Advert. on p. 168.]

Weymouth Share Sale.

The public confidence shown in Weymouth Consumers' Gas Company and Weymouth Water Works Company was evidenced when prices that probably constitute a record were realized at a sale of a number of shares in these Companies. The sale was conducted by Messrs. F. W. Fuller & Son, of 61, St. Thomas Street, Weymouth, and £100 ordinary stock in Weymouth Consumers Gas Company, which is subject to a maximum dividend of 5 per cent., was sold for £107. Three similar units of the same stock were sold for £104, and another lot of the same stock for £106 10s. A further lot of £160 of similar stock was sold at the rate of £106 per £100 worth of stock. Five original (1855) shares of £20 each fully paid in Weymouth Water Works Company were sold for £216.

Trade Notes.

"Positive" Station Meter for Brighton.

Messrs. W. Parkinson & Co. have secured a contract for a station meter of their "positive" drum type, to pass 300,000 c.ft. per hour, in connection with the extension of supply to Worthing by the Brighton, Hove, and Worthing Gas Company.

Staveley Products.

From the Staveley Coal and Iron Company, Ltd., near Chesterfield, we have received copies of some of their recent lists. In these full specifications and illustrations are given of Staveley cast-iron pipes, sand-spun pipes, and the firm's flexible joints, the advantages of which are simplicity, flexibility, ease and speed of assembly, and capability of dismantling in case of temporary mains.

New Season Fire Catalogues.

We have received from the Cannon Iron Foundries, Ltd., of Deepfields, near Bilston, Staffs., and from Messrs. Fletcher, Russell, & Co., Ltd., their new season gas fire catalogues, the former dealing with the new inclined fires in a variety of types and finishes, and the latter with a large range of fires in both black and art finishes. Both of these publications are extremely well produced, and set forth full details and specification of the respective appliances, together with attractive illustrations, many of them in actual colours.

STOCK AND SHARE LIST.

Official Quotations on the London and Provincial Stock Exchanges.

[For Stock Market Report, see earlier pages.]

Issue	Share.	When ex-Dividend.	Dividends. Prev. Hf. Yr.	Dividends. Last Hf. Yr.	NAME.	Quotations. Oct. 8. (Provincial Exchange Oct. 7.	Rise or Fall on Week.	Transactions. Lowest and Highest Prices During the Week.
£			% p.a.	% p.a.				
1,551,868	Stk.	Oct. 3	7⅜	7⅜	Alliance & Dublin Ord. ...	100—110*	...	110—110½
374,000	,,	July 4	4	4	Do. 4 p.c. Deb. ...	80—90	...	...
557,655	,,	Aug. 22	7	7	Barnet Ord. 7 p.c.	132—142	...	135½
300,000	1	Apl. 29	1/9⅜	1/9⅜	Bombay, Ltd.	21/—23/-	+2/-	...
177,750	Stk.	Aug. 22	9	9½	Bournemouth sliding scale	177—187	...	...
550,050	,,	,,	7	7	Do. 7 p.c. max. ...	136—146	...	142
439,160	,,	,,	6	6	Do. 6 p.c. Pref. ...	128—138	...	...
50,000	,,	June 20	3	3	Do. 3 p.c. Deb. ...	70—75	...	...
162,025	,,	,,	4	4	Do. 4 p.c. Deb. ...	90—95	...	95
210,000	,,	,,	5	5	Do. 5 p.c. Deb. ...	115—120	...	...
357,900	,,	Aug. 22	7½	7½	Brighton, Hove, & Worthing 6 p.c. Con. ...	138—143	+½	...
540,000	,,	,,	6½	6½	Do. 5 p.c. Con. ...	125—130	+2½	126—128
195,500	,,	,,	6	6	Do. 6 p.c. B Pref.	125—135	...	...
1,287,500	,,	Aug. 8	5	5	Bristol 5 p.c. max.	107½—108½[a]	+1½	...
120,420	,,	June 20	4	4	Do. 1st 4 p.c. Deb. ...	94—96[a]	...	...
217,870	,,	,,	4	4	Do. 2nd 4 p.c. Deb. ...	93—95[a]	...	...
328,790	,,	,,	5	5	Do. 5 p.c. Deb.	115—120[a]	...	...
855,000	,,	Oct. 3	8	7	British Ord.	125—135[b]	−3	127—129
100,000	,,	June 20	7	7	Do. 7 p.c. Pref.	120—130	...	...
350,000	,,	—	—	—	Do. 5½ p.c. Pref. ...	107—112	...	...
120,000	,,	,,	4	4	Do. 4 p.c. Red. Deb. ...	87—92	...	91—91⅞
450,000	,,	,,	5	5	Do. 5 p.c. Red. Deb. ...	105—115	...	...
160,000	,,	July 4	5	5	Cambridge 5 p.c. Deb. ...	114—119	...	...
100,000	10	May 23	6	6	Cape Town, Ltd.	7½—8½	...	...
100,000	10	Apl. 29	4½	4½	Do. 4½ p.c. Pref. ...	6—7	...	...
150,000	Stk.	June 20	4½	4½	Do. 4½ p.c. Deb. ...	87—92	...	89—90
626,860	,,	Aug. 8	6	6	Cardiff Con. Ord.	102—107	...	104
237,860	,,	July 4	2½	5	Do. 5 p.c. Red. Deb.	105—110	...	...
157,150	,,	Aug. 8	5½	5	Chester 5 p.c. Ord.	89—94[b]	...	...
98,936	1	May 23	2/-	2/-	Colombo, Ltd. Ord....	26/—31/-	...	...
24,500	1	,,	1/4⅜	1/4⅜	Do. 7 p.c. Pref.	18/—20/-	...	...
609,204	1	Apl. 4	-/10'90	-/11'47	Colonial Gas Assn. Ltd. Ord.	10/—15/-	...	...
296,053	1	,,	1/2'54	1/3'30	Do. 8 p.c. Pref.	10/—15/-	...	...
2,078,280	Stk.	Aug. 8	5½	5	Commercial Ord.	102—107	...	105—106
475,000	,,	June 20	3	3	Do. 8 p.c. Deb. ...	70—75	...	74½
807,560	,,	Aug. 8	7	7	Croydon sliding scale	130—140	...	135—136½
469,590	,,	,,	5	5	Do. max. div.	95—100	...	97
500,000	,,	July 4	5	5	Do. 5 p.c. Deb.	115—120	...	118½
542,370	,,	Aug. 8	10	7	Derby Con.	120—130[c]	...	...
55,000	,,	July 4	4	4	Do. 4 p.c. Deb. ...	75—85[c]	...	...
209,000	,,	Sept. 5	5	5	East Hull Ord. 5 p.c. ...	93—98	...	97—98
179,500	,,	Aug. 22	5½	6	East Surrey Ord. 5 p.c.	108—118	...	...
155,019	,,	June 20	5	5	Do. 5 p.c. Deb. ...	114—119	...	...
1,002,180	,,	Sept. 19	†6½	†5	European, Ltd.	117—122	...	115 120
19,405,992	,,	Aug. 8	5⅝	5⅝	Gas Light & Coke 4 p.c. Ord.	22/—24/-[f]	...	23/1½—24/10½
2,600,000	,,	,,	3½	3½	Do. 3½ p.c. max. ...	77—82	...	7-½—79
4,477,106	,,	,,	4	4	Do. 4 p.c. Con. Pref. ...	96—99	...	97½—98½
6,102,497	,,	June 20	3	3	Do. 3 p.c. Con. Deb. ...	77—80	+1	78 - 79½
3,642,770	,,	,,	5	5	Do. 5 p.c. Red. Deb. ...	110—115	...	112—113
2,500,000	,,	,,	4½	4½	Do. 4½ p.c. Red. Deb. ...	106—109	...	107⅞—108½
264,011	,,	Aug. 22	—	6	Harrogate New Cons. ...	104—109	...	...
82,500	,,	Aug. 22	7	7	Hastings & St. L. 5 p.c. Conv.	118—128	...	...
958,740	,,	,,	5½	5½	Do. 3½ p.c. Conv.	100—105	...	102
70,000	10	June 6	15	‡10	Hongkong & China, Ltd. ...	10—11	...	10½
218,200	Stk.	Aug. 22	6	6	Hornsey Con. 3½ p.c. ...	103—108	...	...
5,600,000	,,	June 6	15	14	Imperial Continental Cap.	187—197	...	189½—193
223,180	,,	Aug. 8	3½	3½	Do. 3½ p.c. Red. Deb.	85—90	...	...
285,242	,,	Aug. 8	8½	8½	Lea Bridge 5 p.c. Ord. ...	142—152	...	...
2,145,907	,,	Aug. 22	6	6	Liverpool 5 p.c. Ord. ...	110—111[b]	+½	...
245,500	,,	June 20	5	5	Do. 5 p.c. Red. Pref. ...	100—110[b]	...	...
306,083	,,	July 15	4	4	Do. 4 p.c. Deb. ...	85½—90½[b]	...	...
165,786	,,	Sept. 5	10	8	Maidstone 5 p.c. Cap. ...	150—160	...	...
56,176	,,	June 20	3	3	Do. 3 p.c. Deb. ...	65—70	...	...
75,000	5	June 20	†10	†10	Malta & Mediterranean ...	7½—8½	...	...
392,000	—	Oct. 1	5½	5½	Metropolitan (of Melbourne) 5½ p.c. Red. Deb.	95—100	...	...
171,978	Stk.	Sept. 5	5	5	M. S. D. Utility "C." Cons.	92—97	...	...
718,657	,,	,,	4	4	Do. 4 p.c. Cons. Pref.	80—85	...	83
112,126	,,	July 4	4	4	Do. 4 p.c. Deb. ...	87—92	...	...
148,955	,,	,,	5	5	Do. 5 p.c. Deb. ...	105—110	...	...
675,000	,,	21 May '31	†6	†6	Montevideo, Ltd.	30—50	...	...
2,061,315	,,	Aug. 8	5½	5	Newcastle & Gateshead Con.	20/—21/-[d]	...	...
682,856	,,	,,	4	4	Do. 4 p.c. Pref. ...	90½—91½[d]	+½	...
691,705	,,	June 20	3½	3½	Do. 3½ p.c. Deb. ...	84—86[d]	...	...
277,285	,,	Apl. 29	5	5	Do. 5 p.c. Deb. '45...	105—107[d]	...	...
274,000	,,	Aug. 8	5	5	Newport (Mon.) 5 p.c. max.	86—88[a]	...	...
199,940	,,	Aug. 22	7½	7½	North Middlesex 6 p.c. Con.	135—145	...	...
396,160	,,	Aug. 8	5	5	Northampton 5 p.c. max. ...	88—93	...	...
300,000	,,	Apl. 18	9	7	Oriental, Ltd.	85—95	...	...
205,162	,,	June 20	8	8	Plym'th & Stonehouse 5 p.c.	140—150	...	...
504,416	,,	Aug. 22	8	8	Portsm'th Con. Stk. 4 p.c. Std.	137—147	...	...
241,446	,,	,,	5	5	Do. 5 p.c. max. ...	88—93	...	...
114,000	,,	Aug. 8	5	5	Preston 5 p.c. Pref.	100—105	...	...
686,312	,,	July 18	4	4	Primitiva 4 p.c. Rd. Db. 1911	75—80	...	...
889,813	,,	June 20	4	4	Do. 4 p.c. Cons. Deb.	76—81	...	...
150,000	10	Sept. 19	6	6	San Paulo 6 p.c. Pref. ...	6⅞—7½*	...	...
1,786,968	Stk.	Sept. 5	6	6	Sheffield Cons.	108—112[e]	...	...
95,000	,,	July 18	4	4	Do. 4 p.c. Deb.	92—96[e]	...	...
133,201	,,	Sept. 5	5	5½	Shrewsbury 5 p.c. Ord. ...	113—118	...	116
90,000	10	June 6	15	15	South African	4—6	...	...
6,709,895	Stk.	Aug. 8	7	5	South Met. Ord.	113—116	...	113½—115½
1,185,812	,,	,,	6	6	Do. 6 p.c. Irred. Pf.	130—135	...	132—133
1,895,445	,,	July 4	3	3	Do. 3 p.c. Deb. ...	76—79	...	...
1,000,000	,,	July 18	4	5	Do. 5 p.c. Red. Deb.	108—113	...	...
91,500	,,	Aug. 8	8½	8½	South Shields Con.	130—131[d]	...	...
1,543,795	,,	Aug. 8	6	6	South Suburban Ord. 5 p.c.	111—116	+1	113
300,000	,,	,,	5	5	Do. 5 p.c. Pref.	108—113	...	...
668,887	,,	June 20	5	5	Do. 5 p.c. Deb.	116—121	...	118
647,740	,,	Aug. 22	5	5	Southampt'n Ord. 5 p.c. max.	93—98	...	...
121,375	,,	June 20	4	4	Do. 4 p.c. Deb.	92—97	...	...
200,000	,,	June 20	6½	6½	Swansea 6½ p.c. Red. Deb.	105—110	...	...
1,076,490	,,	Aug. 8	6⅝	6⅝	Tottenham and District Ord.	127—132	...	129¾
300,000	,,	,,	5⅛	5⅛	Do. 5½ p.c. Pref. ...	112—117	...	...
199,005	,,	June 20	4	4	Do. 4 p.c. Deb. ...	91—96	...	...
85,701	,,	Sept. 19	6	6	Tuscan, Ltd., 6 p.c. Red. Db.	67—72	...	...
346,069	,,	Aug. 22	7	7	Uxbridge, Maidenhead, & Wycombe 5 p.c.	128—133	...	...
88,880	,,	,,	5	5	Do. 5 p.c. Pref. ...	107—112	...	...
1,322,220	,,	July 4	7	7	Wandsworth Consolidated	133—138	...	137—138
971,378	,,	,,	5	5	Do. 5 p.c. Pref.	107—112	...	110⅞
1,167,964	,,	June 20	5	5	Do. 5 p.c. Deb.	115—120	...	115½—118½
158,400	,,	Aug. 22	6g	5	Winchester W. & G. 5p.c. Con.	98—103	...	...

Quotations at:—*a.*—Bristol. *b.*—Liverpool. *c.*—Nottingham. *d.*—Newcastle. *e.*—Sheffield. *f.*—The quotation is per £1 of stock. *g* Paid £3, including 10s. on account of back dividends. * Ex. div. † Paid free of income-tax. ‡ For year.

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(This announcement is inserted gratuitously.)

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Just now Peter's rather important, for this is his first term at school, and he's grappling with the intricacies of "A B C" and "Twice Two": difficult subjects to all men of five-and-a-half, but even more difficult in Peter's case because—bad luck—he's totally blind. That's his One Exception.

Peter learns reading, writing, and 'rithmetic through the medium of "Braille"—dull stuff compared with the coloured picture books of most five-and-a-halfs. However, he's a stout lad is Peter, and he's making great progress.

Would you like to know more about him? How, in spite of his "One Exception," he is being educated, and, when older, technically trained and usefully employed.

There is a long waiting list of "Peters" throughout the British Isles, for whom training and accommodation must be provided in the immediate future.

Will you help with a donation or annual subscription? Any sum, large or small, will be gratefully received.

Here's a suggestion. Your eyesight is worth 3d. a year to you. Send Peter and his handicapped pals 3d. for every year you've had it. Now, please, in case it slips your memory. Good idea!

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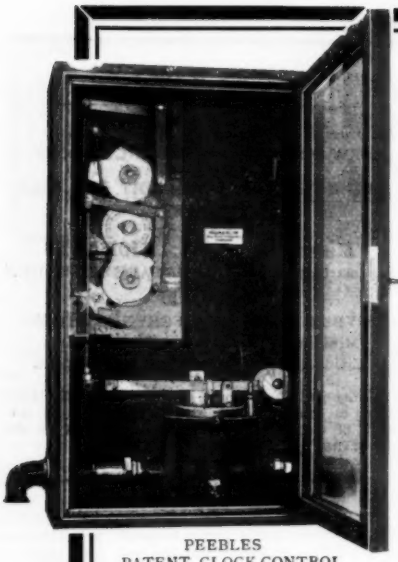

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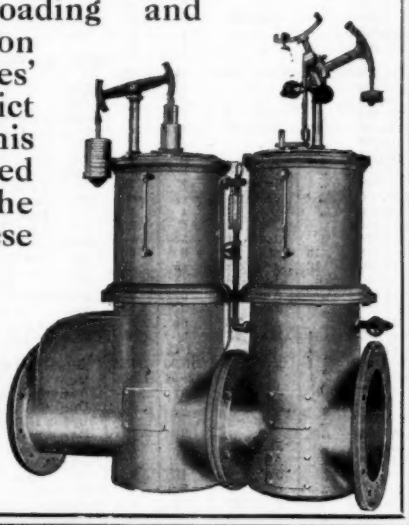

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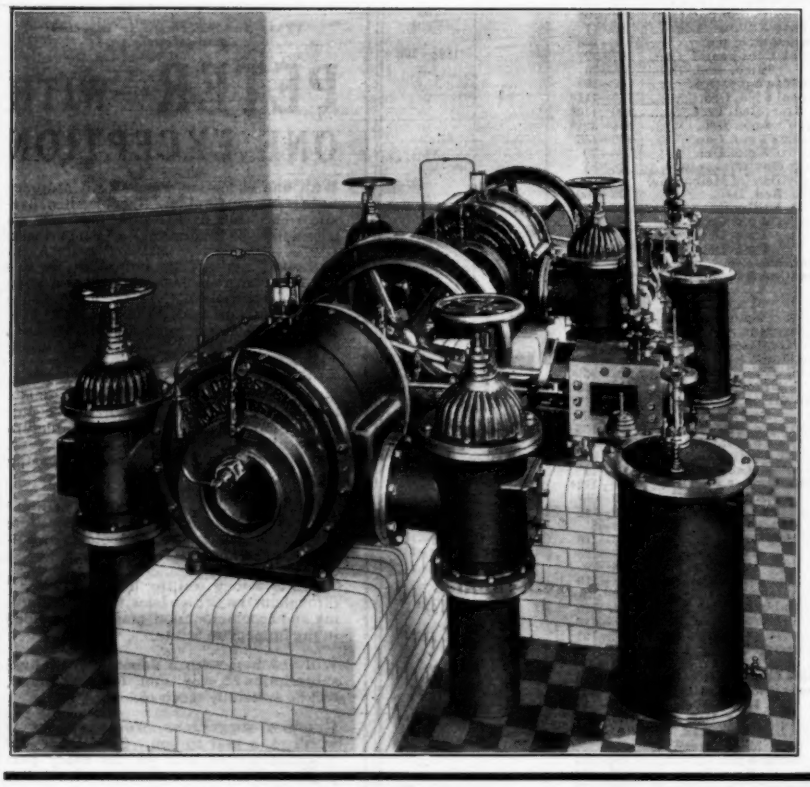

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